The Electrical Industry's Weekly Magazine

May 7, 1956

Electrical World

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What do your employees read?

. . . . . page 31

E S POWER GS W I:
UNIVERSITY MICROFILMS I
313 N 1 ST
ANN ARBOR MICH

LARGEST POWER CONTRACT ever conceived in U.S. involved giant generating plants, extra hv transmission, earned OVEC a citation. Above Philip Sporn, President, and F. R. Shedd, Oper. Vice Pres., note that project was completed ahead of schedule to deliver power to AEC below estimated cost.

SIGNING NOMINATION CITATIONS are General Electric Company's President Ralph J. Cordiner (right), and Harllee Branch, Jr., President of the Edison Electric Institute. E.E.I., which made the nominations, will present the Coffin Award to the winning electric utility in June.

ENLIGHTENED LEADERSHIP and outstanding public relations performance was demonstrated by Washington Water Power Co. with a successful program for the people of the utility's service area—discussed above by K. M. Robinson (r.), President; J. E. E. Royer (l.), V. P. and Gen. Mgr.; and G. M. Brunzell, Div. Mgr.

Coffin Award Nominees Create Dramatic Area Development Plans

Nomination by the Edison Electric Institute of five electric utilities for the coveted Coffin Award does more than justly commemorate their remarkable operating and community achievements during 1955. The number and quality of utility plans considered for nomination reflects the industry-wide acceleration of programs to stimulate individual service area growth. And it characterizes the utility industry's tremendous strides towards translating the concepts of corporate citizenship into full-time, practical action.

To the entire industry, and especially to the five companies nominated, Alabama Power Co., Consolidated Edison Co. of New York, Idaho Power Co., Ohio Valley Electric Corp., and Washington Water Power Co., go the congratulations of General Electric, donor of the Award. General Electric Co., Schenectady 5, N. Y. 301-327

MORE POWER TO AMERICA

GENERAL ELECTRIC

TOP RURAL SALES DEVELOPMENT by Alabama Power included broad farm youth activities, promotion of farm electrification. Planning for the proposed Coosa River Project keynoted the southern utility's foresighted action, helped earn Coffin nomination citation.

OUTSTANDING UTILITY MANAGEMENT and operation by Consolidated Edison climaxed in major contribution to atomic power development. Extensive adequate wiring program, noted here by L. A. Scofield, V. P.—Sales, helped break bottleneck to electrical living.

SECURING PUBLIC ACCEPTANCE for long-range development program for its service area earned citation for Idaho Power. T. E. Roach (r), Pres. and Chairman of Board, with R. F. Ball, Asst. to the Pres., discuss rapid construction program of Snake River hydro projects.

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ELECTRICAL WORLD

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Electrical World

Published for 82 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

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MANAGEMENT

WHAT WILL THEY READ?.....H. L. Brickey 31
Industrial Relations 46
Business Outlook 60
Finance and Regulation..... 63
Statistics 66

GENERATION

PHILO UNIT FITS SPACE LIMITATIONS.....F. M. Porter 48

MEETINGS

NELPA ENGINEERING SECTION AND PURCHASING COMMITTEE.. 16
PCEA ENGINEERING AND OPERATING SECTION..... 18
MVEA ENGINEERING CONFERENCE..... 24
SOUTHWEST ELECTRIC CONFERENCE..... 43

SALES AND SERVICE

..... 59

EDITORIAL AND COMMENTARY

Editorials 5
In the Industry..... 62
Technical Notes 62

INDUSTRY NEWS

Electrical Week 6
Current Events.....8, 15, 20, 26
News About People..... 36
Meetings Calendar 40
Manufacturers and Markets... 52

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COMING NEXT WEEK—The Hoover Commission Report on Power is far from dead, but its recommendations are making slow progress because they are not completely understood. Next week a special report explains what the report offers.

Cable splices made faster, last longer in toughest "proving ground" here in The Bessemer Limestone and Cement Company's quarrying operation. Note the rough surfaces over which the cable is dragged. Under conditions that vary from extreme dryness to complete submersion, Bessemer reports exceptional results from the rugged splices made with Okonite Tapes.

Okonite Tapes reduce down-time for Bessemer shovels

The Bessemer Limestone and Cement Company has reduced down-time on its electric shovels two ways by using Okonite Tapes in splicing its high voltage portable shovel cables. First, tough, waterproof splices can be made in the field without taking the cable to the shop and without buying any special molds and other equipment. Second, splices made with Okonite Tapes have been in service since 1948 without added time-loss in remaking.

Cables and splices are dragged over rocks, frequently lie completely submerged in water, and are constantly exposed to sun, rain, snow and ice. Yet Okonite splices have maintained their waterproof toughness for seven years of this treatment. No wonder Bessemer has standardized on Okonite Tapes.

Each splice is designed to give maximum electrical and mechanical protection for operation at 4160 volts. Okolite Corona-Resisting Tape fuses into a solid wall of self-vulcanizing high voltage insulation. Over the shielding tape applied about the three-conductor core, a solid wall of Okoprene Weather-Resistant Tape gives full neoprene protection to the splice. This combination of Okolite and Okoprene Tapes provides the toughness and complete moisture resistance necessary for continued service under such severe operating conditions.

Try them on your splices—write for a free box of 4 sample tapes to The Okonite Company, EW Tape Department, Passaic, N. J.

Available Through Authorized Dealers Only.

OKONITE **splicing tapes**

3522

EDITORIALS

New Aid to Financing

Timing of security sales can be extremely important. Reason is that the cost of money tends to rise as the demand for money rises. Other factors being equal, a company floating an issue of securities at a time when the market is free of excessive competitive demands could secure a lower rate of interest for its bonds or higher price for its stocks.

This is especially true in today's relatively tight market. This year alone U. S. business plans to spend $35 billion on capital improvements. Many government organizations are coming into the market for money. It adds up to fierce competition for the investors' dollars.

Though this competition can't be entirely eliminated, it can be eased by a thoughtful spreading of issue dates. But the catch is: How do you know the issue dates of other companies or government organizations? Where can you find them?

We have the answer. Beginning in this issue (p 64), Electrical World brings you a schedule of the most important issue dates. This schedule is being furnished by the Irving Trust Co from its "Financing Calendar" service. It will include issues from:

1. Electric and gas utility companies with total assets of over $35 million.
2. Other utilities, such as telephone and water companies, for issues of $5 million or more.
3. Industrial and other corporate offerings for issues of $15 million or more.
4. Municipals and revenue bonds for issues of $25 million or more.
5. The U. S. Government for issues of $1 billion or more.

To keep the schedule up to date, it will be revised every two weeks. It will be a feature of our "Finance and Regulation" section.

The Credo of American Capitalism

We in America believe in large volume and small profit margins—not small volume and large profit margins.

We in America believe in high wages, high productivity, and high purchasing power. They must occur together to spell dynamic growth.

We in America believe in scrapping the obsolete, regardless of its useful life. A new tool, technique, or machine that can do the job better and faster and pay for itself in a reasonable time is a good investment.

We in America believe in consumer credit and have developed and used installment sales techniques to a degree unparalleled elsewhere.

We in America believe in more leisure through a short and highly productive work week. Leisure has produced great new industries that provide entertainment, cultural pursuits, and sports.

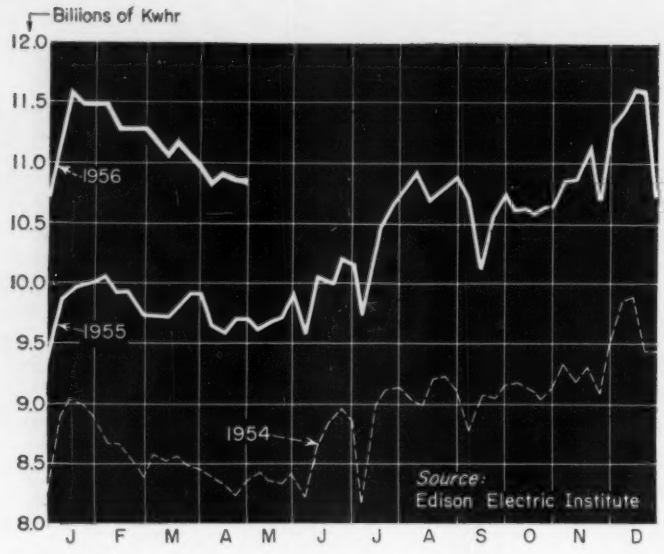
And finally and most importantly, we in America believe deeply in competition versus the cartel. Competition keeps us endlessly, urgently searching and researching for new and better products, more efficient methods of production and marketing.

PHILIP D. REED,
CHAIRMAN, GENERAL ELECTRIC CO.

The above credo is reprinted from the March issue of "The Exchange," monthly publication of the New York Stock Exchange. Though the ideas expressed in it are not new, they seldom have been so simply and clearly stated.

Living by this credo American capitalism has brought about the greatest prosperity and the highest standard of living the world has ever seen. Both refute the malignant efforts of Communists and Socialists to drag down the American people to the level of those living in countries where the economy is governed not by the people through private enterprise but by the politicians and bureaucrats.

ELECTRICAL WEEK



OUTPUT

Week ended April 28
10,867,000,000 Kwhr
Up 12.0%

Atomic Energy Commission requirements — 1,125,000,000 kwhr (Electrical World estimate). Excluding AEC, output increase was 8.9%

Per Cent Change From Previous Year

	Total US	New Eng.	Mid. Atlan.	Cent. Ind.	West Cent.	South-east	South Cent.	Rocky Mount.	Pacific NW	Pacific SW
April 28	+12.0	+10.2	+7.5	+19.4	+11.4	+12.7	+4.0	+10.5	+8.8	+9.3
April 21	+12.3	+13.0	+8.4	+19.0	+10.0	+15.5	+4.9	+10.0	+9.6	+2.9
April 14	+13.7	+12.4	+9.0	+19.7	+10.9	+15.5	+10.7	+13.7	+11.5	+7.6

Seasonally Adjusted Index 214.3 Week Ago 214.6 Year Ago 191.3

Issue's Highlights—Sens Anderson, Gore, and Pastore last week condemned U. S. secrecy on work to harness the energies of the H-bomb. Their criticism followed disclosures in London that Russians are near success in this field . . . Biggest coal-fired generators yet (two 450,000-kw units) have been ordered by American G&E. Pres Philip Sporn cites system growth, experience with other large units as pointing way for new equipment . . . Proponents of federal high dam for Hells Canyon are reported bargaining for votes to push through their bill . . . TVA issues report refuting charges of inefficiency in its coal-buying program . . . Labor groups have come out in favor of exempting utilities from holding company act when they pool resources, but public power supporters oppose exemption.

Sandy Accepts Portland GE Bid—Despite public ownership philosophy of its leaders, Sandy Electric Co-op's members voted 571 to 99 in favor of selling their financially stricken, high-cost system to Portland GE.

Rates—Cincinnati G&E has turned down a proposal by the city that company reduce rates by $3 million a year. City Council Utilities Committee later indicated a willingness to scale this down to $2 million but company declined. Negotiations for new rate ordinance is continuing . . . Seattle City Council has asked City Light officials to approve rate reductions totaling about $500,000 annually . . . Arkansas Supreme Court rejects Arkansas P&L's $4.2-million per year rate increase . . . Clark County PUD of Vancouver reduces rates by $344,500 a year.

Federal Paternalism Condemned—Basin-wide river development plans endanger private electric systems which have traditionally cooperated in federal water development ventures, Washington WP Pres Kinsey M. Robinson told U. S. Chamber of Commerce annual meeting. He emphasized "the hold federal paternalism philosophy has attained on public's mind . . ."

NEWS OF THE INDUSTRY BRIEFLY TOLD

Washington Wire—Senate debate is set to begin this week on Lehman Niagara bill . . . Recent amendments to FPC regulations will result in agency making public great deal more information on opinions, orders, and proceedings. Previously, regulations permitted FPC to hold confidential opinions and orders "for good cause" . . . The House approved $51.8-billion highway construction program after defeating attempts to alter utilities' repayment amendment.

Latest Financing—First Boston Corp group wins $40-million Duke Power 3⅝% bonds (Aaa) due 1986 at 101.529%; reoffers at 102.31% to yield 3.50%. Last triple A issue, Duquesne Light, was offered to public on 3.40% basis on April 4.

Blyth & Co group is offering 70,000 shares California Oregon Power 5.10% $100 par preferred at $100 a share to yield 5.10% . . . Stone & Webster Securities Corp group wins 20,000 shares $4.72 no par preferred at $100.05; reoffers at $102 a share to yield 4.6275%.

Wisconsin Electric Power is offering 463,641 common shares to stockholders on 1-for-10 basis, record April 24 to expire May 15 at $28.75 to yield 5.57% . . . Duke Power is offering 367,478 common shares to stockholders on 1-for-25 basis, record May 3 to expire May 25 at $25 a share to yield 4%.

Automation at "Discount"—As the country develops automation with electricity, it becomes increasingly urgent that inequities existing between public, private power groups be eliminated, Pres A. M. Beebee, Rochester G&E, told North Eastern AIEE meeting. "In a truly automatic world, power is the mainspring and certain areas should not have this vital necessity at a discount while others are penalized," he said.

Zirconium Contracts May Cut Reactor Prices—AEC's contracts last week with three suppliers for 11-million lbs of zirconium in next five years may lead to reduction in nuclear reactor costs. Suppliers are: National Distillers Products Corp, National Research Corp, and Carborundum Co. Prices quoted for metal, vital in reactor cores, is around $6-6.50 a lb contrasted with current market of about $14 a lb.

ABOUT PEOPLE IN THE INDUSTRY

Present legislation governing "socialized power projects will inject the iniquitous preference clause into atomic power era," Cleveland Electric Illuminating Pres Elmer Lindseth told stockholders. In effect, he said, "preference clause thus legally pronounces 4/5 of American people second-class citizens, to be discriminated against in receiving even direct access to tax-subsidized power produced at facilities constructed by U. S. government."

In stirring farewell address to EEI's engineering committees in Chicago last week, retiring Managing Director Col H. S. Bennion placed responsibility for developing young engineers for utility industry squarely on shoulders of engineers themselves. "If you are going to interest good young men in this business you must keep the road open right up to the top. . . .Don't misplace help and be sure your help is wise . . ."

More News About People page 36

Will Russians harness H-energy before U. S.?

Soviet Progress Amazes British

- London lecture reveals near success in controlling the fusion process
- Russian revelations bring condemnation of U. S. secrecy on this project
- Gore cites talk to push for expanded federal reactor building program

While secrecy still clouds United States progress on experiments to control the nuclear fusion process, the energy in the H-bomb, a Russian report in London on Soviet work in this field has British scientists buzzing. Reaction was quick in the U. S. too.

Russian progress in thermonuclear technology, as revealed in London, may force through Congress a far-reaching federal power program—a multi-million dollar nuclear power construction plan.

The Russian report was delivered by Soviet scientist Igor Kurchatov in a lecture to some 300 British scientists at Britain's Atomic Energy Research Establishment at Harwell. He revealed that Soviet attempts to generate controlled energy by fusion of deuterium have nearly succeeded. Much of the data he disclosed would be considered top secret here.

Sen Albert Gore (D-Tenn.), sponsor of a bill calling for the federal atom plant building program, moved in fast on the heels of the London report. Gore warned the Senate: The U. S. is lagging behind Russia, and the only way to get out in front is to undertake immediately a substantial government reactor program.

SEN CLINTON P. ANDERSON

Joining Gore in condemning tight secrecy restrictions on U. S. thermonuclear progress were Sens Clinton P. Anderson (D-N. M.), chairman of the Joint Atomic Committee, and John O. Pastore (D-R. I.).

Several weeks ago, Prof Paul Sherrer, head of the Swiss Atomic Energy Commission, told reporters the U. S. had developed the process for controlling fusion. But AEC wouldn't comment on this report.

Russian Experiments Described

Kurchatov divided his lecture into two parts. The first, and most significant dealt with the possibilities of producing thermonuclear reactions in a gas discharge. The other part confined itself to an account of the Russian nuclear power program, mostly revealed earlier at Geneva.

The first paper on the thermonuclear work is considered of the greatest importance in Britain and Dr B. F. J. Schonland, Harwell's deputy chief, described it as a "very brilliant account." Top United Kingdom atomic experts regard it as the most important statement yet made on controlled nuclear reactions.

The Russian experiments were designed to achieve a fusion reaction by passing extremely large electric current pulses through straight discharge tubes containing various gases but particularly deuterium. Kurchatov said peak currents reached two million amperes; voltages several tens of kilovolts; and maximum discharge energy forty million kilowatts. Temperatures of about one million degrees C were achieved which is the temperature at which fusion might be expected.

Evidence of the fusion of two deuterium atoms would be the emission of neutrons by the discharge, and this mechanism has actually been observed in the Russian experiments. But Russian findings in experiments so far conducted over several years show these neutrons do not arise from the fusion reaction but from unexpected changes in the nature of the gas discharge channel.

Thermal insulation of the heavy hydrogen gas from the container was attempted by use of magnetic field envelope generated by a gas charging current, but melting of the container did occur. Measurements carried out at gas pressures from 0.005 in. of Hg to 1 atmosphere. The discharge gaps varied up to 2 meters. The peak current varied from 100,000 to two million amperes.

Kurchatov said success of further work in this direction will greatly depend on the possibility of creating conditions under which the plasma column will experience multiple oscillations during buildup of current without coming into contact with walls.

"On appraising the various approaches to the problem of obtaining intense thermonuclear reactions we do not deem it possible to completely exclude further attempts to attain this goal by using pulsed discharges. However, other possibilities must also be carefully considered. Especially interesting are those in which the idea of stationary processes may be used," Kurchatov said.

SEN ALBERT GORE

AG&E Orders First Two 450,000-Kw Units

Generators give 3½% better thermal efficiency standard than Kyger Creek's 1955 record

The two largest steam electric generating units in electrical industry history were ordered by American Gas & Electric System late last month. The additions, each with 450,000-kw capacity, will cost a total of $110 million.

Scheduled for completion between 1958-60, the units will be installed on systems of two of AG&E's three largest subsidiaries (Appalachian Electric Power Co, Ohio Power Co, and Indiana & Michigan Electric Co) and will culminate the company's five-year, 2.6 million kw expansion program. General Electric Co will build the turbine-generators and Babcock & Wilcox Co the boilers.

Sporn Cites System Growth

Said Philip Sporn, AG&E president, "The size chosen . . . was made possible by the growing size of our system and by the ability of the AG&E System's 330,000-v transmission network to supply the necessary back-up power from other major generating sources (during maintenance shutdowns)."

Each boiler will be of outdoor design and have operating pressures of 3,500 lb/sq in. They will be the "once-through" type, producing steam at 1,050 F. Double re-heat steam cycles, coupled with the units' size and supercritical pressure, are expected to set a thermal efficiency standard of about 41%, or 3½% better than Ohio Valley Electric Corp's Kyger Creek Plant record in 1955.

To Use Cross-Compound Units

The turbines will be of the cross-compound type, the high-pressure element operating at 3,600 rpm and low-pressure element at 1,800 rpm. Generators, also 3,600 rpm, will be liquid and hydrogen-cooled . . . the stator being cooled by oil circulating through its hollow high-voltage windings and the rotor being cooled by hydrogen.

"We are highly gratified," Sporn said, "at this outcome of the experimental and developmental studies we have been carrying on in the design for a new series of larger, more efficient units to provide the increased power requirements . . . expected in the next several years.

"Our revolutionary Unit 6 at the Philco Plant of Ohio Power, (EW, May 7 and April 16, 1956, p 92, and June 29, 1953, p 72), . . . a cooperative development project, has yielded results which give us a great deal of confidence that the technology of the 450,000-kw units is sound," declared Sporn. "Philo 6 . . . will be higher in pressure (4,500 psi) and in main steam temperature (1,150 F), although of much smaller capacity—125,000 kw." The Philo unit will go into operation late this summer, he added.

The AG&E president stated his company, located in the heart of U. S. coal fields, is "greatly impressed" by the atom's long-term fuel prospects and that "The decision to go ahead with these . . . units is not due to any pessimism on our part over the ultimate feasibility of atomic power. Rather, it is due to an appreciation of the difficulties that remain to be cleared up before atomic fuel can attain a competitive economic position equivalent to that of bituminous coal fuel."

Since nuclear reactor economics improve with size, Sporn explained, the comparable steam-utilizing equipment for AG&E's new coal-fired units "will be perfected and be ready for the day when nuclear fuel can take its place to supplement fossil fuel."

Vote Trading for High Dam . . .

is tactic by which backers of federal Hells Canyon project hope to obtain passage of legislation, nullify Idaho Power's license

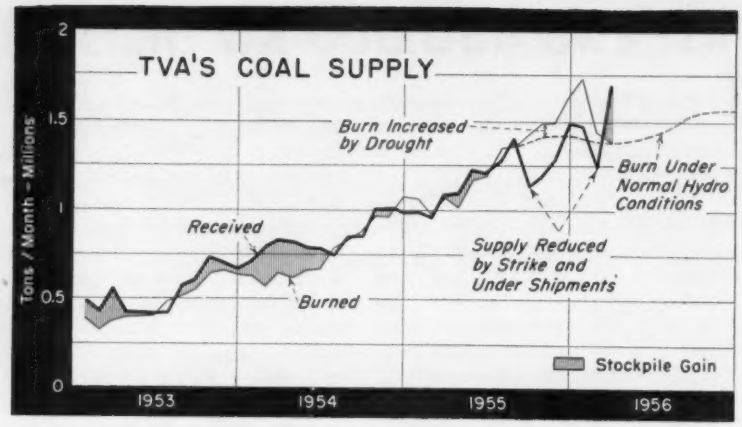
Reports are current in Washington of a deal to push legislation through Congress to authorize a high federal dam at Hells Canyon on the Snake River, and so nullify Idaho Power Co's license to construct three smaller dams on the same site.

The Congressional public power bloc suffered defeat last year when the Federal Power Commission licensed Idaho Power to build Brownlee, Oxbow and low Hells Canyon Dams on the Snake. Since then, both sides have been busy—Idaho Power going ahead throughout the winter in building cofferdams, bridges, and tunnels to ready Brownlee for delivery of power, the Congressional high dam group looking for a leak in the wall of opposition to their proposal. The "high dam" people now say privately they have found a breach—the holdout vote of Louisiana Democratic Sen Russell Long. Long stalled action on the high dam bill last year in the Senate. A confidential poll showed the public power bloc it would fail in a scheduled showdown vote in the Senate interior subcommittee, so the vote was called off.

The high dam's backers are confident that if Long swings over to their side, they can push the bill through the Senate.

They are also hopeful of using leverage on House members. They feel they can guarantee passage of the Fryingpan-Arkansas project, now stalled in the House Rules Committee, in return for a defection on the part of Hells Canyon holdout J. Edgar Chenoweth (R-Colo.), whose unfavorable attitude has stalled the high dam bill in the House Interior Committee. Chenoweth wants Fryingpan-Arkansas desperately, since his eastern-slope constituency would benefit most from the project. But, so far, he has not been able to force the Rules Committee to grant clearance. Trading his Hells Canyon vote may be a way out.

There's still another possibility for the high dam: If Chenoweth won't cooperate, the public power bloc—made up mostly of Democrats—may successfully bring pressure on Reps James A. Haley (D-Fla.) and George A. Shuford (D-N. C.), who withheld their votes in the House Interior subcommittee last year, but who have committed themselves to high dam opposition.



TVA Hits Coal-Buying Critics

Agency's 16-p report refutes charges of inefficiency, negligence made in series of newspaper ads by Nashville financier

Tennessee Valley Authority, frequently criticized in the past for its coal buying policies, has risen up to take issue with its critics.

TVA now is the nation's largest coal buyer and its purchases account for more than one-tenth of all the coal used by the nation's power systems. In 1951, TVA used 1.2 million tons of coal; in 1955 it burned 12 million tons, an increase of nearly 1,000%.

In 1955, delivered prices of coal ranged from $3.83 per ton at the Shawnee Steam Plant to $4.78 a ton average at John Sevier. In 1951-52, TVA was paying $5.00 and more average per ton. Its Btu costs in 1955 averaged 18¢ per million for the system.

The latest event that has prodded TVA into defending itself in a comprehensive report on its coal-buying program was a series of advertisements attacking TVA on this score.

Purchasing Methods Explained

The ads were taken by a Nashville financier, Justin Potter, and charged that TVA's coal-buying policies have been inefficient and negligent. The TVA report does not mention Potter by name. But TVA officials interviewed in Knoxville said the exhaustive 16-p report, accompanied by maps and diagrams, was in answer to Potter's attack.

TVA listed these points in its report:

1. TVA buys coal from private producers by competitive bidding, as required by the TVA act for major purchases. It "cannot set the price of coal" but "relies primarily on the forces of competition to keep costs at a minimum."

2. TVA tries to buy coal mainly from fields nearest its steam plants.

3. TVA and other power systems are taking up the slack in coal production. They provide a new type of market, requiring less preparation at the mines, inviting greater mechanization, encouraging more complete use of coal deposits.

4. In 1955, railroad strikes, a mine work stoppage, and drought required TVA to draw on its stockpiles.

"TVA stockpiles have served their emergency purpose," said the agency. "Some, as a consequence, are now below normal size and below what TVA considers desirable. The process of rebuilding them is underway.

TVA said that as of March it was receiving coal at the rate of 20 million tons a year and expects to purchase 18 million tons during 1956. It said stockpiles at its major steam plants increased by about 400,000 tons from March 1 to April 15.

In a recent advertisement in the Chicago Tribune, Potter charged that TVA is "rampant communism" and listed a series of purported comparisons between TVA and "the Russian system."

The charges Potter listed in the advertisement were these: "Communist enterprises pay no taxes; neither does TVA. Communist enterprises are owned entirely by government; so is TVA. Communist enterprises have no regulations; neither does TVA. Communist enterprises allow no competition; neither does TVA. Communist enterprises are noted for their arrogant attitudes and ownership of cheap politicians; so is TVA."

Paul Evans, TVA information director in Knoxville, said the charges in the advertisements were "so utterly absurd it speaks for itself," and added that he "would not dignify it by a point-by-point answer."

Unions Back Holding Co Act Exemption

Public Power opposition developed last week to a bill to exempt from the Public Utility Holding Co Act of 1935 joint private utility company ventures into production of low-cost power, including atomic power experiments.

Clyde Ellis, general manager of the National Rural Electric Cooperative Association, was lead-off witness as a Senate interstate commerce subcommittee continued hearings on the bill (S-2643), introduced by Sen John O. Pastore (D-R. I.), (EW, April 30, p 58). His arguments against the bill were for the most part, old-hat, but with this refinement: Ellis indicated a strong desire on the part of NRECA's management to see the Federal Power Commission's jurisdiction over private utilities broadened to overlap the financial regulatory functions carried out by the Securities & Exchange Commission.

Last week, union management went along with the Pastore bill's backers. Robert MacGregor of the New York State Electrical Workers Association, and Andrew J. McMahon, president of local 12, AFL-CIO Utility Workers Union of America, pledged support of some 190,000 workers in favor of the proposal.

Austin L. Roberts of the National Association of Railroad and Utilities Commissioners, and representatives of several other utilities joined in endorsing the bill as the hearings continued last week.

SELKYD–a new kind of plastic improves watthour meter base plates

and Sangamo brings it to you!

In order to find the ideal material from which to mold watthour meter base plates, Sangamo and Glaskyd, Inc., pooled their efforts.

The result is Selkyd.*

A Selkyd base plate on a watthour meter has many advantages. It resists corrosion. It has a high resistance to arc tracking. Having great impact strength, a Selkyd base plate will stand up to physical punishment. And because Selkyd is an inert organic substance, base plates made from it have great dimensional stability.

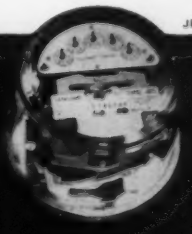
Adoption of this Selkyd base has in no way altered the electrical characteristics of the J2.

Every Sangamo J2S meter you buy will come to you with a base plate made from this remarkable new plastic . . . and at no extra cost.

Selkyd base Sangamo meters will be shipped to you sealed. You'll find them so accurately calibrated . . . so solidly built . . . that no adjustment is necessary.

**A thermosetting resin combined with glass fibers—in contrast to ordinary phenolics having wood fibers as a filler.*

JM56-3



SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

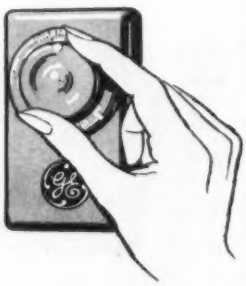
G-E ELECTRIC RADIANT

a winter load that can improve annual

There are many utilities in the country which are considering electric house heating as one means of developing winter residential load to improve their annual load factor.

But what new problems does electric house heating present? Which types of electric heating should the utility promote? When and how should it be done? These and other questions must be answered before the utility can proceed.

In electric radiant heating, as developed by General Electric, many utilities are finding a practical, profitable and immediate answer to such questions. Here are some of the characteristics that make electric radiant heating a favorable type of load for them:



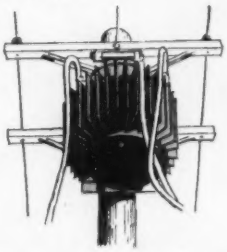
1 DIVERSIFIED DEMAND—Each room in each house has its own complete heating system, controlled by its individual room thermostat. The varying power requirements for each room, together with the varying requirements for each house make electric radiant heating a well-diversified load. Operating data so far available on electric radiant heating load characteristics show that peak demand does not exceed 70% of total connected load for an individual home, and for a group of homes, is considerably less than 70%.

2 NIGHT-TIME LOAD—The biggest part of the residential heating load occurs during the evening and early morning hours when industrial load is normally lighter.

3 BALANCES COOLING LOAD—For utilities that have a heavy summer air-conditioning load, electric radiant heating can be used to build winter load and improve annual load factor.

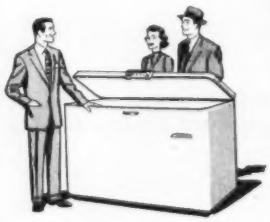
4 A RESISTANCE LOAD—Electric radiant heating is a unit power factor load, and from this viewpoint is a most desirable type load for the power company because it is free of power factor problems.

5 A PERMANENT LOAD—Once the electric heating load goes on the line, it is usually there for the life of the house.



6 WINTER EFFICIENCY—Because of lower ambients, system capability is more effectively used during the winter months when electric heating is required.

7 LARGE POTENTIAL MARKET—G-E electric radiant heating is practical for new homes, whether ceilings are plaster or dry-wall construction. In addition, supplemental or additional heat may be installed in either new or old homes by using G-E baseboard resistance heaters.



8 BETTER CUSTOMERS—Experience has shown that the residential customer in a house equipped with electric radiant heating becomes a better customer for the utility for all other electrical services. Consequently, electric radiant heating is another step in the direction of the all-electric home.

9 PEOPLE WANT IT—The enthusiasm home owners have for electric radiant heating not only opens up the whole residential heating market as a new source of revenue for the utility, but also — because it gives the utility a higher stake in providing services necessary for modern living — makes the utility a still more vital factor in the life of the communities it serves.

HEATING FOR HOMES

load factor for utilities which have summer peaks

G-E ELECTRIC RADIANT HEATING OFFERS MANY BENEFITS TO UTILITY CUSTOMERS

Practical — Ceilings provide a large unobstructed area for the radiating surface, efficiently radiating heat and warming objects and surfaces in the room. Through conduction, all these heated surfaces heat the air to a comfortable level. And, because G-E electric radiant heating is installed entirely within ceilings, building space that would otherwise be needed for heating equipment and fuel-storage can be devoted to living space. Also the expenses of a chimney can be eliminated entirely in homes that are equipped with G-E electric radiant heating.

Comfortable — Radiant heat from above is nature's way of heating. It provides complete comfort at lower room air temperatures. Practically eliminates drafts or air currents. Assures a comfortable humidity ratio because it doesn't "dry out" the moisture content of the air. All temperatures within the room are remarkably constant, with little variance between floor and ceiling.

Clean — With G-E electric radiant heat there is no dirt, soot, or dust from combustion or from circulating currents of air. Walls, ceilings, drapes, and furnishings stay clean and fresh much longer.

Convenient — The G-E electric radiant heating system has no rotating parts, operates without making any sound at all. No annual servicing plan is required, no refueling or checking of fuel supplies. Because there are no radiators or wall heaters, furniture and decorating can be arranged where and as desired.

Flexible — Individual room thermostats permit the temperature of each room to be controlled as desired. And because each room has its own thermostat, any changes in wind or sun that affect one or two rooms will be compensated for by the individual heating systems in those rooms. Here are all the advantages of zone control carried to the ultimate of room by room control.

Residential customers will like and want this new way of heating homes once they are acquainted with its many benefits. Consequently utilities which now have a summer peak are presented with a good opportunity to improve their load characteristics by promoting electric radiant heating.

For utilities interested in this electric heating load, the General Electric Company has prepared a portfolio of educational and sales helps. Included are technical data required for specifying and installing electric radiant heating systems, suggestions for utility sales programs, builder and consumer information, and samples of available promotion literature and display cards. Write Wiring Device Department, General Electric Company, Providence 7, Rhode Island.

SEND FOR UTILITY PORTFOLIO on G-E Electric Radiant Heating. Contains a complete file of educational and sales helps — technical data as well as promotion material — for utilities interested in this type of heating load.

Wiring Device Department
General Electric Co., Providence 7, R I.

Please send me a copy of the "Sales Portfolio on G-E Electric Radiant Heating".

Name.....

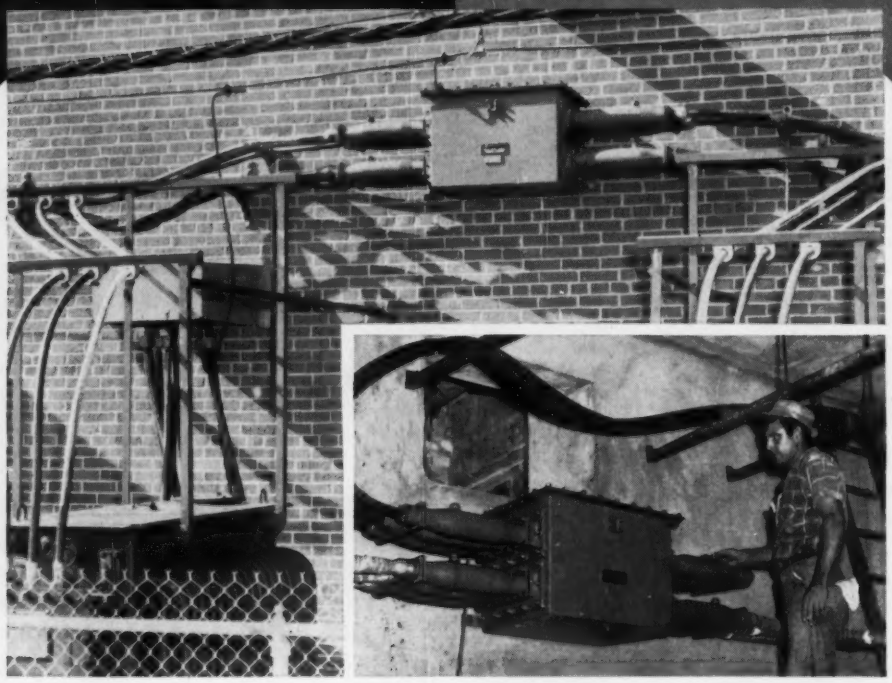
Company.....

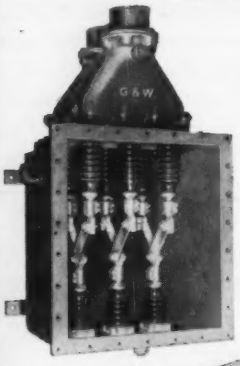
Address.....

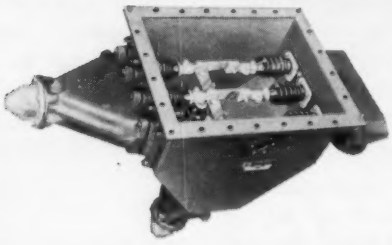
.....

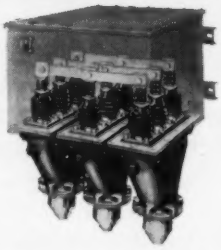
Progress Is Our Most Important Product

GENERAL ELECTRIC

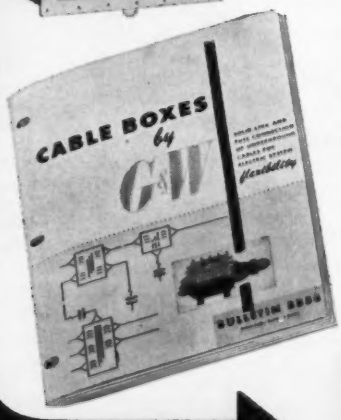








G&W TYPE "OL" OIL FILLED LINK BOXES



may be just what you need—for interconnecting high voltage cables that require infrequent sectionalizing at no voltage.

Cableheads are compound filled unit sealed potheads with copper links between capnut lugs. Cable entrances are wiping sleeve or stuffing box. Boxes are welded steel, with Resistoyl gasketed lids and flanges—oil filled for minimum size. (Larger Type "AL" air filled boxes are also available.) Voltage ratings—7.5 and 15 Kv (standard) and up to 34.5 Kv (special).

Send for Bulletin BB55, a comprehensive listing of various types of link, fuse and splice boxes.

G&W ELECTRIC SPECIALTY CO.
7780 Dante Avenue, Chicago 19, Illinois

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G&W

B561

EEI Meet to Feature Five Topics

Sessions will highlight private vs public power, public opinion, the future, management-labor relations, and the atom

Five major areas of vital, timely interest to the electrical industry will headline the Edison Electric Institute's 24th annual convention at Atlantic City, N. J., on June 4-6.

Leaders of utilities, labor, industry, and government are scheduled to present authoritative views on the topics in light of past happenings, present developments, and prospects of the future. The main program highlights and featured speakers include:

Private vs public power . . . Ways to halt the continued drive toward nationalized power, despite the service, cost, and favorable opinion gains of investor-owned utilities, is the topic of Harllee Branch, Jr, president of EEI and Georgia Power Co, lead-off speaker in the first general session.

Gordon M. Freeman, International president, International Brotherhood of Electrical Workers, will describe "The American Workers' Stake in Free Institutions," and how labor, management, and others must assume responsibilities to maintain U. S. freedoms.

Public opinion . . . How do you sharpen perceptions of public opinion so that approval-winning facts can best be presented? This is the question Charles E. Parker, president of Central Surveys, Inc, will answer in the convention's second session. He'll describe what facts the public has and what misinformation, what gaps of unawareness exist, and how the public reacts to conflicting claims.

The future . . . B. L. England, Atlantic City Electric Co president, will explain his views on the electrical industry's ability to meet challenges of increasing industrial productivity and the growing dependency upon electric companies' service.

What to expect on the federal budget, expenditure limitations, and taxation is the topic of Rep Frederic R. Coudert, Jr, (R-N. Y.), a member of House Committee on Appropriations.

Management-labor relations . . . What happens when objectives of management are irreconcilable with those of labor leaders? Mark W. Cresap, Jr, executive vice president, Westinghouse Electric Corp, will analyze this crux of the bargaining table in light of the company's own experience during its 156-day strike.

The atom . . . The electric industry's dependency upon public consent will become increasingly important as utilities turn to atomic energy for another fuel source. This view, and the reasons for it, will be discussed by J. F. Fairman, engineering vice president, Consolidated Edison Co.

Opening the third general session will be presentation of the Reddy Kilowatt Annual Report Award and Certificates of Merit. Presiding will be Vice Pres G. W. Ousler, Duquesne Light Co, and EEI awards committee chairman. Presentation of the Charles A. Coffin Award will be on June 6.

Col and Mrs. H. S. Bennion will be guests of honor at an evening reception, June 4, at Hotel Haddon Hall from 5 to 7 pm. Col Bennion retires June 1 as EEI managing director after 30 years varied service with the institute and its forerunner, National Electric Light Association.

Registration begins at noon, June 3, in the Hotel Traymore lobby.

News of the business sessions, official notices, a roster of registrants, and general interest topics will appear in the Unconventional Daily, a newspaper produced and sponsored by Electrical World.

Cowlitz Raises Legal, Political Issues

Workmen, on a slowed-down construction schedule, prepare the site for Mayfield Dam of Tacoma, Wash., City Light on the Cowlitz River, despite a threatened legal closure of the $138-million project.

The city recently appealed to the state supreme court a superior court decision which found that construction of the dam would interfere with navigation and thus is contrary to an old state law.

Meanwhile, the dam threatens to become an issue in the Republican gubernatorial race. Gov Arthur B. Langlie, in backing the state law, has run into opposition with Attorney General Don Eastvold, an avowed candidate for gubernatorial nomination. "The 1954 Supreme Court decision is binding on Gov Langlie, or any other governor," said Eastvold, referring to a decision which found state laws banning dam construction to be void in view of the federal government's right to authorize the dams. Langlie had previously expressed unwillingness to run again, but belief is growing he might be a candidate if Cowlitz becomes an issue.

BRITISH COLUMBIA ELECTRIC CO headquarters building will be outstanding example of modern electric usage, R. M. Bibbs, of the company, explains to his fellow worker, J. C. McAdam, and to M. F. Hatch of Washington Water Power Co

Service Is Industry's Show Window

Ingledow stresses need for service continuity in keynote speech to NELPA. B. E. Electric Co's new headquarters building will serve as model for others

Quality of electric service is our only show window. We must evaluate it continually and give more thought to service continuity. This was the keynote sounded by T. Ingledow, vice president, British Columbia Electric Co, at the 23rd general meeting of Northwest Electric Light and Power Association engineering and operation section and purchasing committee. The meeting was at Vancouver, B.C., April 11-13.

B.C. Electric Co's new 22-story, electrically heated office building will be its showplace for the use of electricity in a commercial building, according to R. M. Bibbs. Building will have 800 tons of air conditioning, 215 kw of electric heating for snow and ice melting, and 70-100 ft-c of light intensity from continuous luminous ceilings on each floor. Off-peak power will heat water in three 900-kw electric boilers. Three-phase, 480-v, 60-kw heating elements energized in banks will prevent cycling and high demand surges. The 350F water system will store about 21 million Btu, enough for operation without power over a 3-hr peak.

Monthly residential load factor characteristic of the heat pump is not so favorable as a combination of air conditioning and multiple thermostatic-controlled electric space heating units, said J. C. Beckett, Wesix Electric Heater Co. Some utilities are emphasizing heat pumps on the blind assumption that electric space heating is undesirable and so are overlooking the desirable combination of electric heat and air conditioning.

On the controversial subject of high secondary voltages R. W. Bullard, Ebasco Services, said one factor already at work in favor of 255/440-v secondary voltages is availability of standard 240-v distribution transformers that can about reach this level. Other favorable factors are the growing use of 240-v single-phase appliances pressure to increase the standard 120-v level to 125 v, and growing difficulties in serving air conditioning and other motor load from 120/208-v networks.

Bullard suggested the industry consider this combination of voltages—125/250-v single-phase, 125/216-v 3-phase (network voltage), 255/440-v 3-phase; and 250/

500-v delta 3-phase. With these voltages, complete interchangibility of all equipment in the 250-v single-phase class, as between the two main secondary voltages, will become a reality.

Experience shows that paper insulation is still preeminent for intermediate, high, and extra-high voltage cables, said Bullard. Troubles are mounting with water blisters on PILC cables with Neoprene jackets used in wet locations. For lower voltage, non-metallic sheath cables in underground and station service uses stand up well only in dry areas.

Adjustable Links Aid in Sagging

In stringing the first twin-conductor 345-kv line in America B.C. Electric found adjustable links in the insulator string assembly useful in sagging the two conductors to within 2 in. of equal elevation, F. O. Wollaston said. A greater difference in elevation of the conductors held 18 in. apart with spacers may increase the tendency to flop-over. Prestressing the conductors 10% before final sag also helps to attain design sag elevation. The greatest problem in stringing the twin conductors is to obtain a near-equal stress in each conductor, Wollaston said.

Both single and twin-conductor EHV lines can show a temporary sharp rise in radio interference because of smoke, dust, or industrial vapors, said George Phillips, Alcoa. His company hopes to produce a pre-aged EHV conductor for use in congested areas.

Bigger Conductors Cheaper than Capacitors

For the proposed 345-kv single-circuit line from Lewiston, Idaho, to Portland in the Pleasant Valley-Mountain Sheep transmission system, Wendal Morgan, Washington Water Power Co, said that twin 795-MCM ASCR conductors will provide 50-Mw increase in load capability for $435,000 increase in cost. Series capacitors at $11/kvar would cost about $1.6 million for the same increase.

Reporting on capacitor switching among NELPA companies, Morgan said the greatest problem is the switches themselves. This includes excessive maintenance, bushing flashovers on plain-break oil circuit breakers, and switch failures during switching of large substation capacitor banks. There appeared to be no trouble where oil switches or breakers of sufficient capacity are used.

Describing a new vacuum interrupter switch (EW, July 25, 1955, p 179), H. H. Schwager, Schwager-Wood Corp, said the company is working on a design to interrupt 2,500 amp at 115 kv. Current erosion of the tungsten contacts is a major problem, he said.

Meter Can Control Capacitor Switching

L. D. Johnson, Sangamo Electric Co, described a new indicating thermal demand meter which can be used to control capacitor switching from voltage, current, watts, or vars.

In discussing the current trend to reduced basic impulse levels for transformers, P. H. Light, General Electric Co, said it is very important to maintain clean oil in reduced-BIL units. James Mann, Allis-Chalmers Mfg Co, pointed out that two-step BIL reduction can mean a $40,000 saving on a 345-kv transformer. And T. J. Bliss, Westinghouse Electric Corp, added that two-step down BIL transformers still will provide normal life expectancy.

Costs and performance of a supervisory installation at a large substation, typical of 26 planned or existing installations, were presented by G. F. Green, B.C. Electric Co. Installed cost is about $33,000, exclusive of control channels, maintenance is about $50 per month, service reliability is 99.75%. Total annual costs, excluding operators' wages, is $5,400, about one-seventh of the cost of manual station operation.

Four dual-fuel, 23,000-kw units will comprise B.C. Electric's planned 92-Mw gas turbine installation in the Vancouver area, V. W. Ruskin said. The unattended, remote-control station will firm up secondary hydro power during critical water years and save an estimated $400,000 annually over providing sufficient firm hydro. Compared to an equal amount of steam generation, the gas turbines will cost 33% less per kw, have 24% of the operating and maintenance costs, and have 22% less energy cost at 15% load factor.

Gas Turbines Effective in Thermal Plants

Simple-cycle gas turbines will find use in existing 20-100-Mw steam plants with the exhaust used to heat feedwater or to preheat combustion air, said P. G. Morse, General Electric Co. In gas-fueled plants, the flow-gas turbine combination is attractive with the exhaust used as boiler combustion air. For new 20-100-Mw steam plants the gas turbine can provide all boiler combustion air or supercharge the boiler.

New Reactors Now in Labs

There are a number of new power reactor designs in advanced state of laboratory-type study, said C. R. Midtlyng, Rocky Mountain Nuclear Power Study Group. These are new reactors from the ground up and not improved earlier types. They are about five years behind present power demonstration reactors. A reactor can't act like an atomic bomb. But reactor types vary with respect to their inherent possibility of runaway.

In maintaining material inventories E. M. Naughton, president, Utah Power & Light Co, suggested utilities take advantage of faster delivery of material through better means of transportation from warehouses, distributors, suppliers, and manufacturers.

No end to the current nickel shortage is seen until 1958, with the worst problem to come this year and next, announced Kenneth Geist, Allis-Chalmers. And competition from pipe line companies poses a problem in the availability of heavy steel plate. Adding to these shortages, Geist, said, electrical equipment manufacturers are in a squeeze as increased prices from raw material suppliers cannot be passed onto utility customers.

Poles and Crossarms Still Scarce

Competition for timber from wood products industries will determine the future price and supply of crossarms and wood poles, according to Tom Connelly, Joslyn Mfg Co. Former crossarm manufacturers are turning to more-profitable plywood production, and smaller stud mills are producing 2 x 4's from low-grade timberlands. However, the summer of 1957 may see a better supply—but not plentiful—of poles and arms.

In the field of purchasing, Fred Hodge, Portland General Electric Co speculated on whether the industry is still in a "white sale" period; whether equipment book prices are of any value; and whether electric utilities would do better to advertise for bids, as do government agencies, as a means toward serving customers at the lowest cost.

PCEA Studies Operating, Design Philosophy

E&O CONFERENCE PROGRAM is discussed by B. L. Peter, Pacific Gas & Electric with E. A. Paine, Portland General Electric; and R. C. Blankenburg, Southern California Edison

Operating and design philosophy for tomorrow's utility engineer was previewed and discussed during the recent annual conference of the engineering and operating section of the Pacific Coast Electrical Association. A record registration of 871 attended the ten parallel sessions held at San Francisco.

The conferees learned about a 325-Mw, 5,000-psi, 1,200F turbogenerator, discussed the economies of greater mechanization and the use of series capacitors for distribution, and considered the field testing of equipment under actual system conditions.

Present day design and operating practice in Europe is influenced by such factors as cheap labor, expensive and imported material, unavailability of land, scarcity of financing, and an impending shortage of fuel and hydro potential, C. W. Leihy, editor, Electrical West, said.

Sweden Plans 600-Kv Lines

In Sweden plans have been made for a 600-kv transmission system, a 15,000-Mva air blast breaker, and an underground steam plant in the southern part, he reported. All western Europe will be tied together in the future by a 380-kv grid, portions of which are now in operation at lower voltages, extending from Sweden to Sicily.

Pattern for tomorrow's turbogenerator may be set by a 325-Mw unit in which supercritical steam enters at 5,000 psi and 1,200F and exhausts at 2,500 psi and 1,000F to a "very high pressure" portion. N. L. Mochel, Westinghouse Electric Corp, said that upon leaving the vhp-section, the steam is reheated to 1,050F before it enters the hp-section at 966 psi. With another pass to the reheater, the steam flows to the hp and lp-sections.

Mochel also suggested using four 5-Mw gas turbines in combination with individual pressurized-furnace steam generators in a layout for a 170-Mw combined-cycle plant.

Testing of interrupting equipment for Southern California Edison Co system is done under actual system operating conditions with load currents equivalent to 150 Mva at 4 kv, 500 Mva and 1,500 Mva at 69 kv. R. K. Klumb of that company urged the industry to do more fullscale testing in proving interrupting devices.

Series Capacitors Debated

Series capacitors in the distribution transformer neutral offer increased revenue and better voltage regulation, release vars to the system, and reduce flicker. But against these advantages, L. J. Flanigan, California Electric Power Co, pointed out series capacitors introduce a large voltage rise upon secondary faults and the possibility of ferro-resonance.

R. E. Reinbold, Arizona Public Service Co, added that series capacitors are an effective temporary means of solving low-voltage complaints, especially when crews are busiest. Underscoring the need to go slow with series capacitors, N. R. Sheppard, General Electric Co, said they are not a cure-all.

Savings in distribution construction result from preassembling crossarms in the shop, using aerial ladders for stringing and pole-top work, and using three-man crews for straight line work in subdivisions, P. C. Oldershaw, PG&E, reported. Coding of preassembled units for ease in preparing specifications also saves time and money.

Tension stringing of new conductor into an energized line or when reconductoring saves up to 25% over slack stringing, said M. A. Kirsch, PG&E.

When losses and other factors are properly evaluated, use of much larger conductors for distribution are economically justified, according to E. R. Sample, SCE; and M. P. Goudy, Arizona PS. Russel Hulse, Arizona PS, pointed out that use of equivalent aluminum conductor can save 30-33% over copper.

Economics of serving commercial load at 120/208 v and 265/460 v were analyzed by Robert Remington, Westinghouse. The higher secondary voltage has proved to be more economical to the utility. The spot network-radial system, where transformers are paralleled at one location, is more economical than the conventional secondary network.

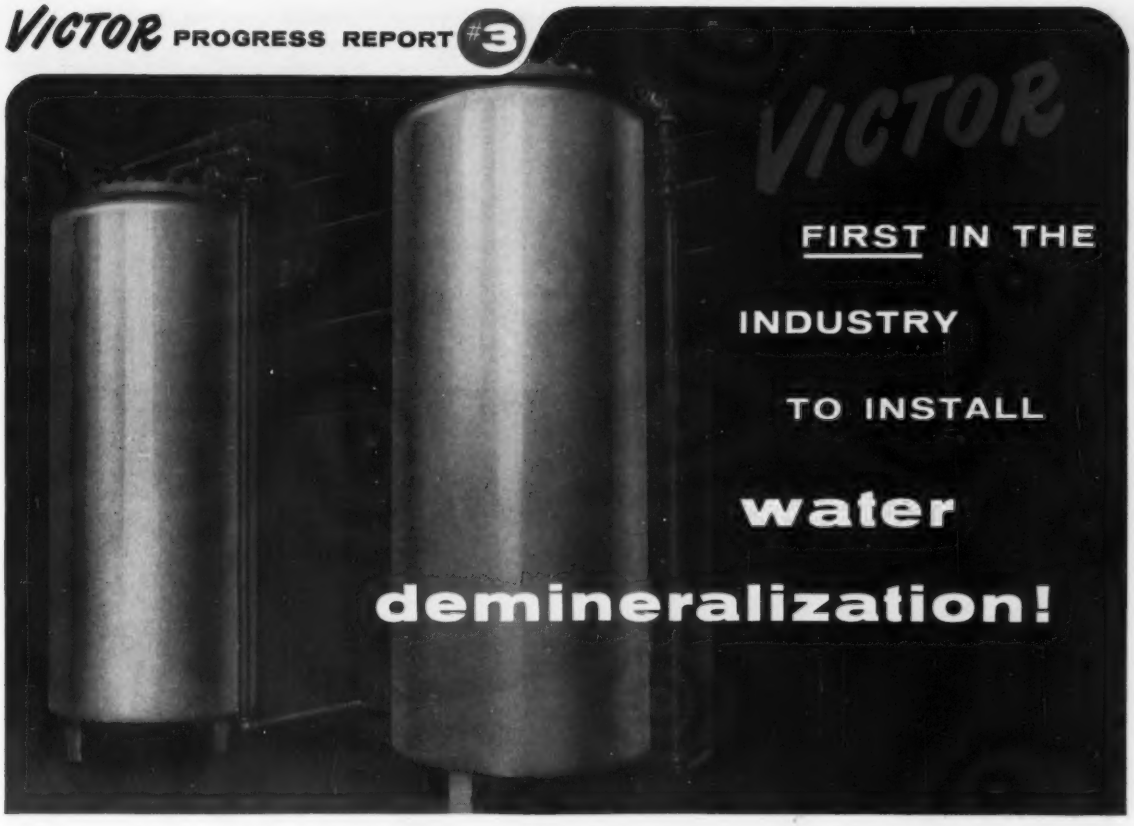
Cites Cable Precautions

To eliminate the build-up of voids in cables, M. H. McGrath, General Cable Corp, advised utilities to avoid use of transformer oil. It presents the hazard of not absorbing the hydrogen generated by ionization. He warned also against use of Freon-nitrogen mixtures for finding cable leaks. J. B. Bowen, San Diego G&E Co, reported only one failure in seven years' experience with unshielded, 5-kv, rubber-insulated cable used generally as substation risers.

Availability of markets for old insulating oil led to opposing viewpoints. Parker Williams said San Diego E&G

(*Continued on page* 20)

VICTOR PROGRESS REPORT #3



Victor's extensive ceramic research first brought to light the fact that minerals in processing water cause microscopic agglomerates of glass-like impurities which result in fluctuations in insulator characteristics. As a result, Victor was the *first* porcelain insulator manufacturer to install water demineralization equipment, part of which is shown above. For several years, *all* processing water used in Victor's plant has been demineralized.

Exhaustive tests have proved that Victor *Purified* Porcelain Insulators, made with demineralized water, have: (1) improved thermal resistance; (2) unmatched porcelain hardness and density; (3) higher average puncture values, and (4) better tension, torsion, cantilever and impact values.

Another example of Victor's ability to give you better insulators through research and modern manufacturing facilities.

SPECIFY VICTOR
Purified Porcelain
Insulators!

VICTOR INSULATORS DIVISION
I-T-E CIRCUIT BREAKER CO.
VICTOR, N. Y.

Low and High Voltage Pintypes • Suspensions • Guy Strains
Spools • Switch and Bus Insulators • Custom Designed Porcelain
Insulator Hardware

"BETTER INSULATORS THROUGH RESEARCH"

PCEA Studies Operating

(*Continued from page* 18)

can sell old oil for 7¢ a gal and has found reclaimed oil has only 50% of new oil life. J. L. Buckley reported PG&E has no market for old oil and saves up to 11¢ a gal by re-refining. He said reclaimed oil is fully equal to new oil in all respects.

Based on a 2-unit, 80-Mw plant, outdoor hydro plant design shows an advantage of $1.67 per kw over an enclosed plant, Maurice L. Dickinson, Bechtel Corp, asserted. Increasing the plant to four 40-Mw units raises the advantage to $2.06.

New materials with promise of use in hydro installations, said W. J. Rheingans, Allis-Chalmers Mfg Co, include: T-1 steel for scroll cases, Ampco bronze for wearing parts of water wheels subject to abrasion and cavitation, and modular iron for turbine parts because of its machinability, strength, and ductility.

Definite trend in impulse turbines from horizontal to vertical shafts with three to six jets per wheel was noted by I. M. White, Pelton Division, Baldwin-Lima-Hamilton Corp.

Dry cleaning of hydrogenerators with corn cob dust blown by 60-psi air costs about 40% of manual methods, according to H. R. Daniels, PG&E.

Big New York Beacons: 'Tiara' or 'Toys?'

Described as a new electronic tiara by the owners and "some big new toys" by one magazine, four 1-ton war surplus searchlights undergoing tests, above, were scheduled to blaze over the world's biggest city this week from 90th floor of the Empire State Building. The beacons' 2,500-w short arc mercury bulbs, fixed to revolve counter-clockwise so airplane pilots won't be confused, will beam out 2-billion candlepower. Weather permitting, they'll be visible from 80 mi away by ground observers, 300 mi by air. The bulbs were made by Lamp Division of Westinghouse Electric Corp.

Emergency Roles Set for Utility Leaders

Interior Department is working on a plan to appoint electric utility executives to serve as regional administrators in defense emergencies. Details of the plan have not been revealed, but the regional chiefs, by delegation of the federal Civil Defense Administration, are expected to take charge of power allocations, distribution, and emergency efforts to restore service in any area disrupted by H-bomb or A-bomb attack or other calamity.

Regional directors from the ranks of utility companies will be named for a dozen or more integrated power territories blanketing the nation, each served by interconnected energy systems. A brief announcement of the emergency setup is expected soon, but the selection of regional disaster managers probably won't be completed for another month.

NEWS BRIEFS

Delayed completion dates of three Tennessee Valley Authority steam generating units, caused by the Westinghouse Electric Corp strike, have been announced. Affected plants, unit capacity, and revised turn-over dates are 1) Gallatin No 1, 225,000 kw, July; 2) Gallatin No. 2, 225,000 kw, November; and 3) Shawnee No. 10, 135,000 kw, August.

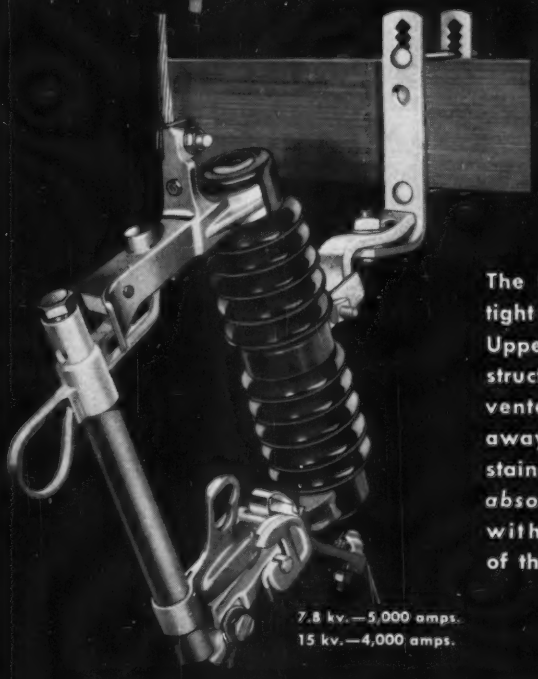
TVA's pump storage unit No. 2, Hiwassee Dam, is being tested. Called the largest of its kind, the 59,500-kw addition will generate power during peak, then pump water back into Hiwassee Lake during off-peak hours for re-use.

Low Ice Harbor Dam bid for three turbines was apparently submitted by S. Morgan Smith Co, York, Pa. The amount was $4,258,430. Turbines are scheduled for delivery Dec. 1, 1959, and April 1 and Aug. 1, 1960. Major construction work on first cofferdam begins about July, 1956.

Three hurdles for Priest Rapids Dam still need clearing before Grant County Public Utility District No 2 can meet its scheduled July 1 construction date: Firm contracts for sale of power with one or more major consumers; sale of revenue bonds based on power contracts; and figuring the best bid for construction of the Columbia River project.

British Columbia Power Commission has awarded a $2.6-million contract to Maxwell Simson & Associates, Vancouver, to supply seven Cooper-Bessemer, 3,000-kw diesel units at new Prince George and Quesnel stations. The units can convert to natural gas when it becomes available.

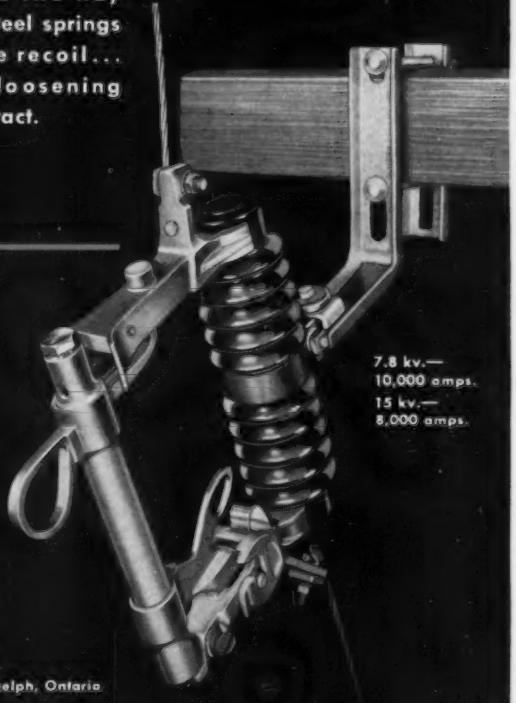
Takes the shock... protects the contact



7.8 kv.—5,000 amps.
15 kv.—4,000 amps.

KEARNEY
Heavy Duty
Type "G" TRIP-OUT

The KEARNEY Type "G" remains as strong and tight as new . . . even after interrupting many faults! Upper contact has unique shock-absorbing construction that permits the fuse cartridge to be front-vented. Burning gasses are directed harmlessly away. And two-way stainless steel springs *absorb* the recoil... without loosening of the contact.



7.8 kv.—
10,000 amps.
15 kv.—
8,000 amps.

Extra Heavy Duty
Type "G" TRIP-OUT

All the advantages of the Heavy Duty Type "G"—plus extra rugged fuse cartridge to withstand repeated high faults. Reliable interruption of low current faults as well. There's a fast, complete interruption—opening action causes Fuse link to be "whipped" out without depending on expulsion force.

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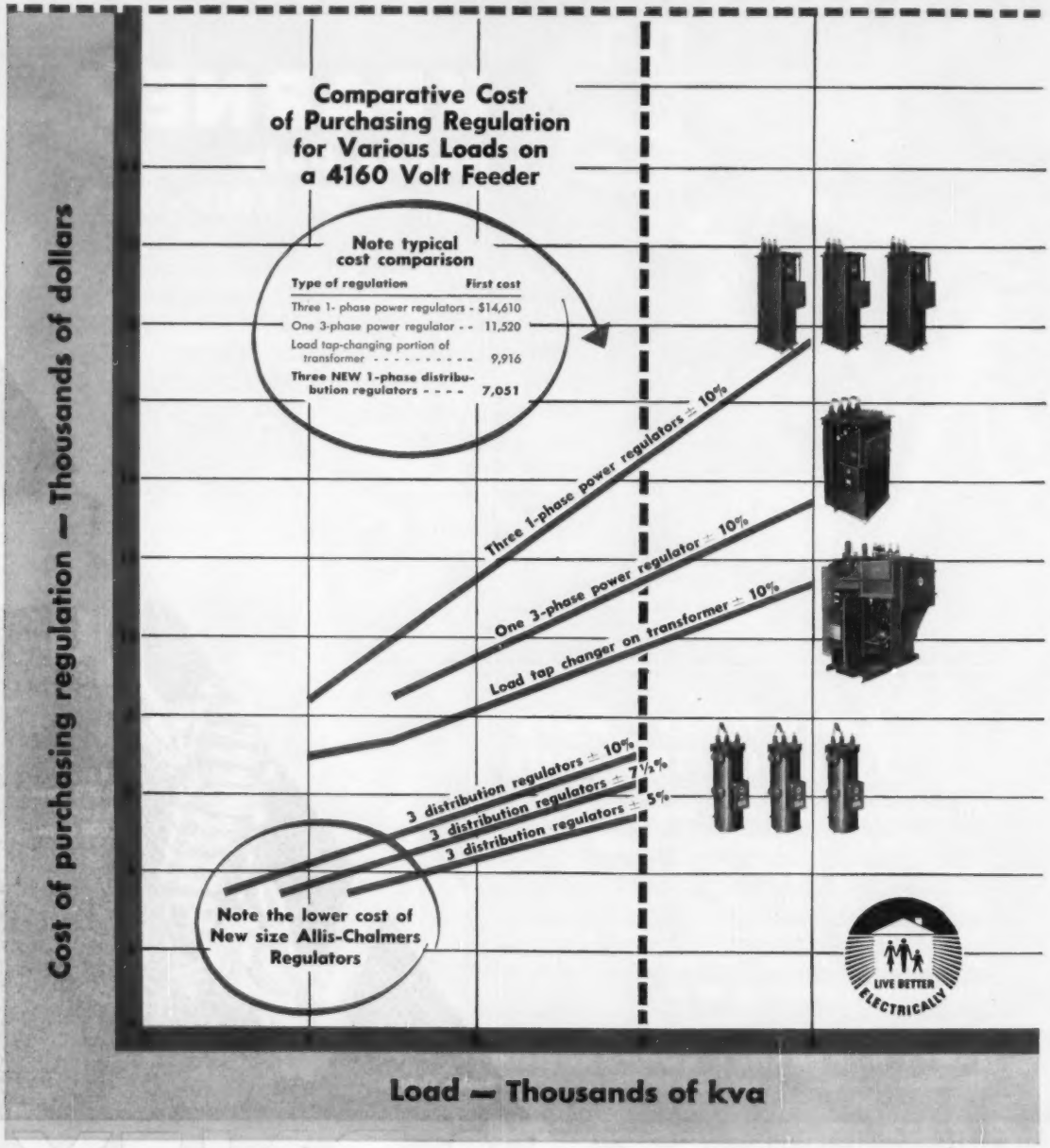
-305

for BETTER CONSTRUCTION
SAFER MAINTENANCE
Specify KEARNEY
JAMES R. KEARNEY CORPORATION ST. LOUIS MO GUELPH, ONT.
The Mark of Quality PRODUCTS

Save 24% to 50% with...

Now Larger Units to Distribution Regulators instead of


Comparative Cost of Purchasing Regulation for Various Loads on a 4160 Volt Feeder
Note typical cost comparison
Type of regulation | First cost
Three 1- phase power regulators - $14,610
One 3-phase power regulator - - 11,520
Load tap-changing portion of transformer - - - - - - - - - - 9,916
Three NEW 1-phase distribution regulators - - - - 7,051
Three 1-phase power regulators ± 10%
One 3-phase power regulator ± 10%
Load tap changer on transformer ± 10%
3 distribution regulators ± 10%
3 distribution regulators ± 7½%
3 distribution regulators ± 5%
Note the lower cost of New size Allis-Chalmers Regulators
LIVE BETTER ELECTRICALLY
Cost of purchasing regulation — Thousands of dollars
Load — Thousands of kva

GET INFORMATION

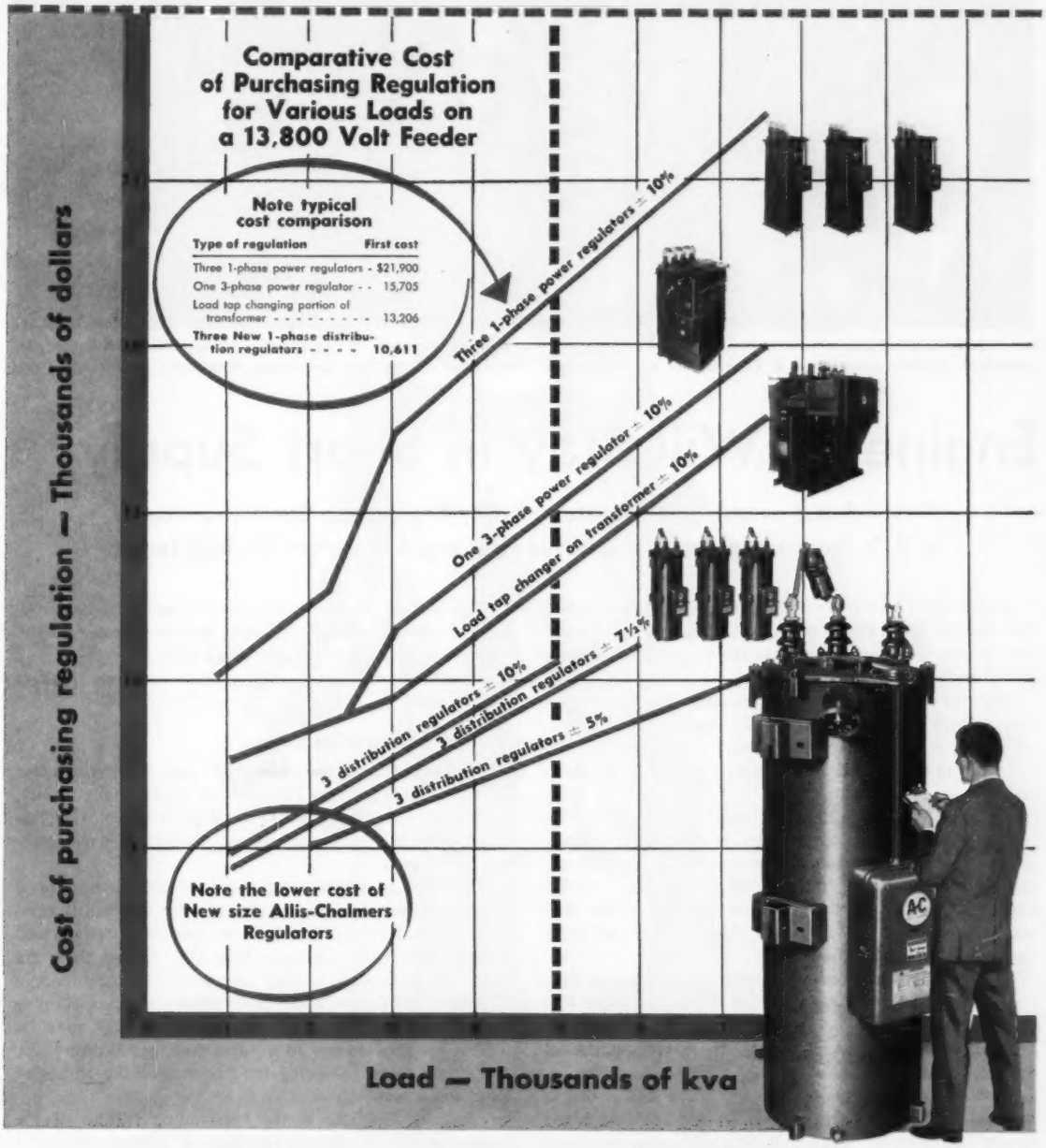
Call your nearest A-C office for complete story, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

A-5041

ALLIS-

..New Regulator Ratings

167 Kva Permit Use of Station Regulators or LTC Transformers


Comparative Cost of Purchasing Regulation for Various Loads on a 13,800 Volt Feeder
Note typical cost comparison
Type of regulation | First cost
Three 1-phase power regulators - $21,900
One 3-phase power regulator - - 15,705
Load tap changing portion of transformer - - - - - - - - - 13,206
Three New 1-phase distribution regulators - - - - 10,611
Three 1-phase power regulators ± 10%
One 3-phase power regulator ± 10%
Load tap changer on transformer ± 10%
3 distribution regulators ± 10%
3 distribution regulators ± 7½%
3 distribution regulators ± 5%
Note the lower cost of New size Allis-Chalmers Regulators
Cost of purchasing regulation — Thousands of dollars
Load — Thousands of kva

Check New Range of Ratings

VOLTS	AMP
14,400	50, 100
7,620	15, 25, 50, 75, 100, 150, 219
5,000	50, 100, 150, 200
2,500	100, 150, 200, 300, 400

CHALMERS

AT GENERAL SESSION, left to right, are S. M. Sharp, vice president, Southwestern Gas & Electric; H. W. Nussbaum, general chairman of Engineering group; and H. N. Muller, Jr, assistant to the vice president, Westinghouse Electric Corp

Engineers Will Stay in Short Supply

Westinghouse executive tells Missouri Valley Engineering Conference reason is U. S. industrial growth. Load building is urged to correct low load factor

America will be forever short of engineers and scientists. The reasons for it lies in the accelerating face of automation in manufacturing as well as the industrial and scientific growth of our country.

This was the picture of the engineering manpower situation painted by H. N. Muller Jr, assistant to the vice president of Westinghouse Electric Corp, at the 27th Engineering Conference of Missouri Valley Electric Association.

Speaking before 812 utility engineers attending the conference in Kansas City, April 18-20, Muller warned that even if all those qualified to assimilate scientific and engineering education followed those courses, it would not be enough. Still the important thing, he said, is to attract students in the higher IQ brackets as they make the best engineers and scientists.

S. M. Sharp, vice-president, Southwestern Gas & Electric Co, joined Muller in calling for efforts to interest high school students in engineering. Utilities had a further job, he said, of showing young engineering graduates the advantages of working for a utility.

A second problem facing utilities, Sharp said is that of reduced load factors. He called for load building activities to correct this. But in the meantime, engineers will have to sharpen their pencils to keep costs from going up out of proportion to increases in revenues.

The three-day conference also heard a wide variety of engineering and operating subjects discussed. They included: Selection of the economic size of turbogenerator units, condenser designs for once-through boilers, atomic power plant design, reduction of basic insulation levels in high voltage transformers, mechanization of construction, secondary voltages of future power system, and the economics of using aerial secondary cable.

Grouped by subjects here's what conference speakers had to say:

Steam Generation

Most economical turbogenerator sizes for a particular system will range from 7% to 10% of its total capacity, according to A. G. Mellor, General Electric Co. He visualized economic unit sizes of 500 to 600 Mw as power systems grow.

Once-through boilers, necessary for supercritical pressures and showing some advantages for subcritical pressures, present special problems in condenser design, said R. A. Wilson, Allis-Chalmers Mfg. Co. Among these are cantamination due to leakage and attack by free ammonia of copper and copper alloys in air offtake sections. Double tube design may be used, or condenser tubes may be welded to tube sheets to control leakage, Wilson said. Aluminum tubes are being used to reduce the effects of ammonia attack.

Very fast response is the outstanding feature of the commutatorless exciter installed on a 35-Mw generating unit by Iowa Power & Light Co, W. G. Kaldenberg stated. The equipment has performed very satisfactorily for more than a year.

Detailed design of Commonwealth Edison Co's nuclear power plant has not yet been started, according to a paper by V. A. Elliott of GE. However, features of the plant

(*Continued on page* 26)

BURNDY

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Engineers in Short Supply

(*Continued from page* 24)

include ability of the reactor output to follow turbine load automatically and use of subcooling to obtain more power from the reactor.

After seven years Oklahoma Gas & Electric Co remains well pleased with the performance of its combination steam-gas turbine cycle, J. W. Blake reported. Initial cost was low, efficiency is high, and maintenance costs have been reasonable.

Transformer BIL

Corona-free design, greater knowledge of switching surge values, and characteristics of the modern lightning arrester indicate that great benefits can be obtained by reducing basic insulation levels, J. R. Mann, Allis-Chalmers Mfg Co, told the conference. Lower investment costs and reduced transformer losses made possible by reducing insulation levels are among the benefits to be achieved by a 2-step reduction in BIL.

Load Control

A 25,000-kva arc furnace load and attendant problems of load swing, plus heavy interconnections with neighboring systems, prompted Kansas City Power & Light Co to buy modern load control equipment, according to W. W. Scott. The new equipment takes care of tie-line bias, flat load operation or flat frequency operation, and performs other functions as dictated by the chief operator of the system.

S. B. Yochelson, Goodyear Aircraft Corp, described a special-purpose computer made by his company that computes power-dispatch information by combining data on fuel costs, incremental heat rates, incremental transmission losses, and station limitations with data on system loads and tie-line power requirements.

Secondary Distribution

Aerial secondary cable, using aluminum conductors, was installed by the Oklahoma Gas & Electric in a 170-acre area to serve 500 customers and 685 ultimately, C. H. Wyatt, said. Pole spacing is 300 ft. Services were taken from the messenger at the most convenient location. Cost of the installation was slightly less than that of the conventional overhead.

Economics of serving growing residential loads at 220/480 or 265/460v were explored by H. E. Lokay, Westinghouse, who said the problem must be considered on an area basis. Primary voltages are part of the system which must be considered as a whole.

Among developments credited by R. K. Woodson for cutting cost of underground jobs in Kansas City include: assembly-line trenching, laying of buried street light cable, backfilling and tamping, all in one pass; the hydraulic concrete breakers; a pneumatic tamper; and a cable reel trailer with hydraulic reel handling mechanism.

Metering and Relaying

Meter men are now prepared to handle the metering of 277/480-v systems, GE's L. A. Edlund told the conference. Introduction of this voltage brought problems, but they have been solved, he asserted.

Pilot wire relaying is being used by Iowa-Illinois Gas & Electric only on circuits that are too short or otherwise unsuited for impedance relays, said K. R. Anderson. Special types of relays are used. There have been some false operations, and corrective measures are being studied.

Connections for aluminum on the underground system present special problems. With compression connectors there must be more indents than with copper, and they must be deeper. Aluminum tubing for cu-al connections must have a thicker wall for a copper than for the aluminum portion, J. J. Hennessy, Burndy Engineering Co, pointed out.

D. H. Sandell, Aluminum Co of America, said that for small substations, stranded aluminum is used on bus work because high strength is not required. Structural shapes are used for moderate and large substations. For large loads, channels and angles are used.

O. G. Anderson, A. B. Chance Co, discussed uses of special tools for hot line splicing and working ACSR conductors. Methods were demonstrated.

Atomic, Mining Industries Will Hold Joint Meeting

The first joint conference of atomic and mining industry leaders is set for June 25-26 in Denver, Colo., by the Atomic Industrial Forum, Inc, and the Denver Research Institute.

Utility and atomic manufacturing company executives, and representatives from financial fields, government, and education are expected to attend. The sponsoring organizations, headed by Walker L. Cisler, president of the Forum and of Detroit Edison Co, and Shirley A. Johnson, Jr., Institute director, anticipate an attendance of more than 400.

The sessions will cover aspects of uranium including geology, exploration, development, mining, and processing. Industrial progress in use of atomic energy for power, propulsion, process and space heating, and radiation will be described.

Questions will be explored on economics of atomic energy utilization and relative importance of fission, fusion, and other energy forms like solar, coal, and petroleum. Government laws and regulations and importance of related minerals such as thorium also will be considered at the meeting.

After the meeting, a two-day tour is planned of the Colorado Plateau, heart of the nation's uranium producing area.

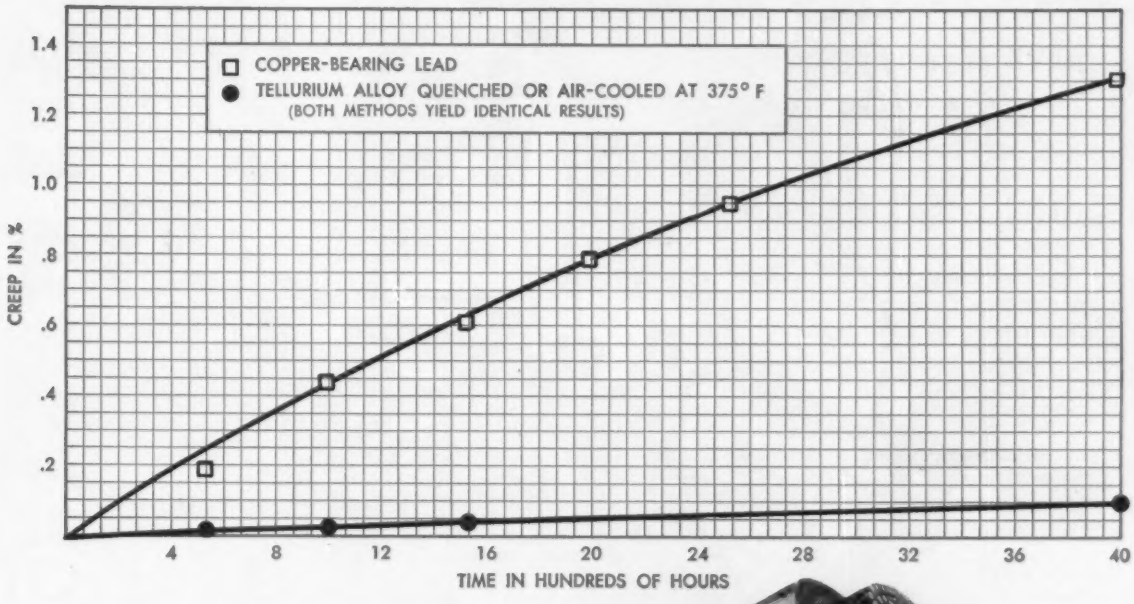
EEI Drops Rate Hike Plan for AEC's Paducah Unit

Electric Energy, Inc, has withdrawn its request for a $71,000 increase in rates on energy supplied Atomic Energy Commission's Paducah, Ky., atom plant. The 3.1% rate hike would have covered the period Jan. 1-June 30, 1956. Federal Power Commission had held brief hearings on the request.

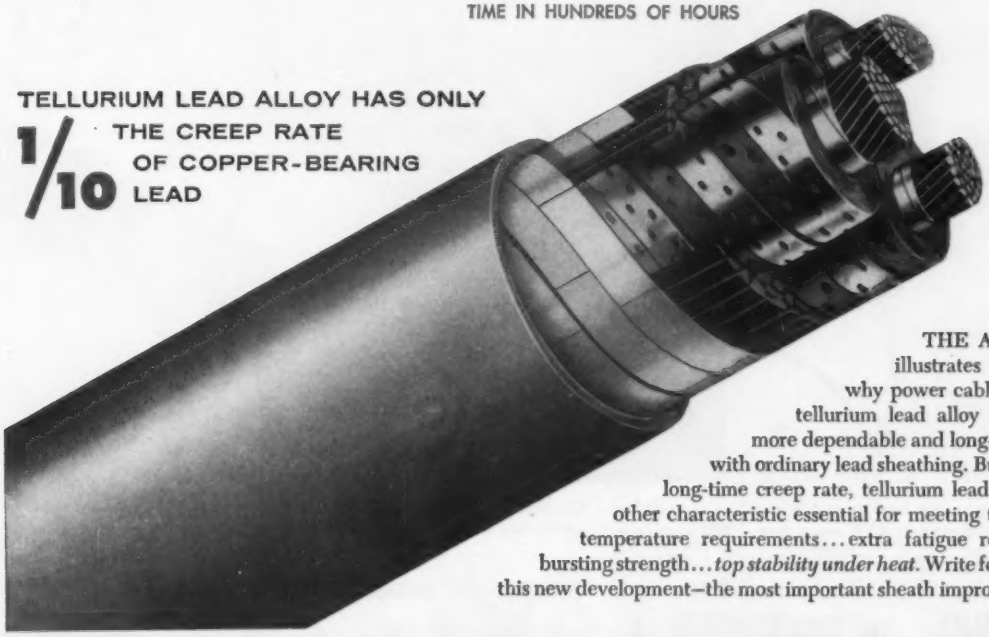
Electric energy and its five sponsors —Central Illinois Public Service Co; Kentucky Utilities Co; Illinois Power Co; Mississippi Power & Light Co; and Union Electric Co of Missouri— are now negotiating with AEC for "changes which will not affect the rates."

ROEBLING PAPER POWER CABLE WITH TELLURIUM LEAD ALLOY SHEATH

CREEP OF TELLURIUM LEAD ALLOY AND OF COPPER-BEARING LEAD
AT 200 PSI - 150° F



TELLURIUM LEAD ALLOY HAS ONLY
1/10 THE CREEP RATE OF COPPER-BEARING LEAD



THE ABOVE GRAPH illustrates one big reason why power cable with Roebling tellurium lead alloy sheath is vastly more dependable and long-lived than cable with ordinary lead sheathing. But besides its low long-time creep rate, tellurium lead alloy has every other characteristic essential for meeting today's load and temperature requirements... extra fatigue resistance... high bursting strength... *top stability under heat.* Write for full facts about this new development—the most important sheath improvement in years.

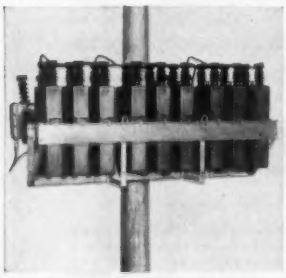
ROEBLING

Subsidiary of The Colorado Fuel and Iron Corporation

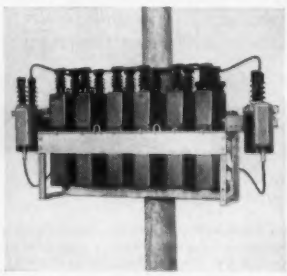
JOHN A. ROEBLING'S SONS CORPORATION, TRENTON 2, N. J. BRANCHES: ATLANTA, 934 AVON AVE. • BOSTON, 11-15 STILLING ST. • CHICAGO, 5525 W. ROOSEVELT RD. • CINCINNATI, 3253 FREDONIA AVE. • CLEVELAND, 13225 LAKEWOOD HEIGHTS BLVD. • DENVER, 4801 JACKSON ST. • DETROIT, 915 FISHER BLDG. • HOUSTON, 6216 NAVIGATION BLVD. • LOS ANGELES, 5340 E. HARBOR ST. • NEW YORK, 19 RECTOR ST. • ODESSA, TEXAS, 1930 E. 2ND ST. • PHILADELPHIA, 230 VINE ST. • PITTSBURGH, 1723 HENRY W. OLIVER BLDG. • SAN FRANCISCO, 1740 17TH ST. • SEATTLE, 900 1ST AVE. S. • TULSA, 321 N. CHEYENNE ST. • EXPORT SALES OFFICE, 19 RECTOR ST., NEW YORK 6, N. Y.

L-M's new 50 kvar capacitors are now available in 600 kvar switched capacitor racks. Assembly weighs only 43% more than a 300 kvar rack.

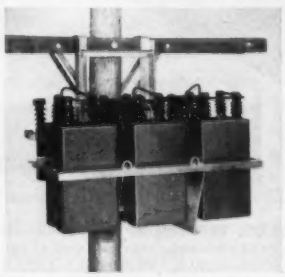
Capacitor unit has same width, same thickness as a 25 kvar capacitor and will fit into existing NEMA standard hangers and L-M single-row racks.



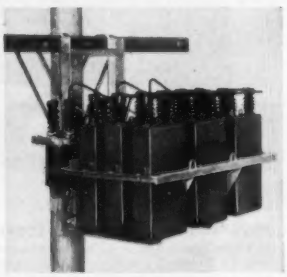
450 kvar single-row switched capacitor rack with L-M's Elemex 50 kvar capacitors. Weighs only 12% more than a 300 kvar single-row rack with 25 kvar capacitors.



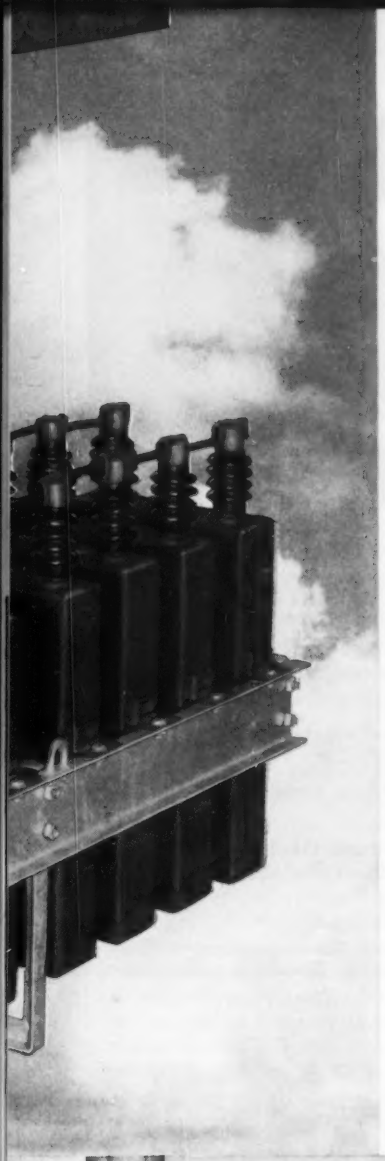
300 kvar single-row switched capacitor rack with L-M's Elemex 50 kvar capacitors. Assembly is quick and easy to install, inspect, and maintain.



300 kvar multi-row switched capacitor rack with L-M's 50 kvar capacitors. Switched racks are supplied with dependable L-M Kyle type NR oil switches.



450 kvar, 2400 volt multi-row switched capacitor rack with L-M's 50 kvar capacitors. Weighs only 150 pounds more than a 300 kvar rack with 25 kvar capacitors.



L-M's New 50 KVAR Capacitors Provide Greater Capacity Per Pole

Offer less weight and less pole space per KVAR

By **N. K. DELANEY**
Product Manager
Capacitors and Regulators
Line Material Company

Now you can hang capacitor racks of larger capacity on a pole with L-M's new 50 kvar Elemex® capacitors. Racks are factory-assembled and wired, shipped ready to install on distribution systems rated 2400 to 13,800 volts, multi-grounded wye. Bank sizes may be up to 450 kvar switched, 600 kvar unswitched multi-row racks, and up to 600 kvar switched or unswitched single-row racks.

Less Weight per KVAR

Line Material's new 50 kvar, 2400 volt capacitor weighs 109 pounds compared to 68 pounds for a 25 kvar unit. A 600 kvar, 2400 volt unswitched multi-row rack weighs only 51% more than a 300 kvar rack, and a 600 kvar, 2400 volt switched single-row rack weighs only 43% more than a 300 kvar rack.

Less Space per KVAR

L-M's new 50 kvar unit has the same width, same thickness as a 25 kvar capacitor and only 10 inches of additional height. It fits into existing NEMA standard hangers and into L-M's present single-row rack. Capacity of a single-row rack can be *doubled* with L-M's 50 kvar capacitors. A 450 kvar single-row switched rack with 50 kvar capacitors is approximately 2 feet narrower than a 300 kvar rack with 25 kvar capacitors. Handling, installation and maintenance costs per kvar have all been reduced with L-M's new 50 kvar unit.

Other Features of L-M's Elemex Capacitors and Capacitor Rack Assemblies

Elemex capacitors are individually dried and completely impregnated under vacuum with low-temperature Elemex liquid dielectric.

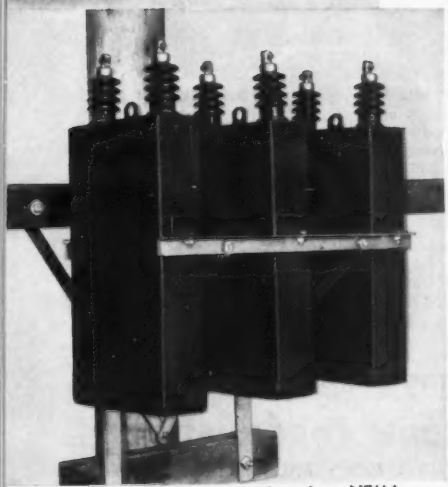
Unit has strong solder-sealed bushings of one-piece wet-process porcelain, "Paragroove" clamp-type connectors, and aluminum metallic coating under alkyd resin paint.

Assemblies have only one plug-in connection point per phase for control wiring, and one terminal box for all three phases.

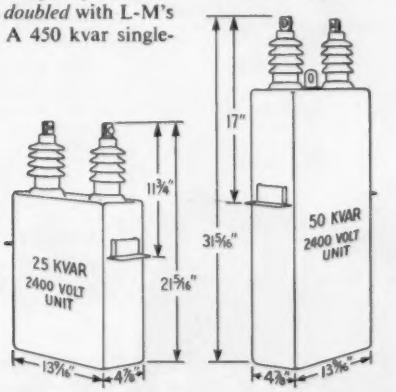
Assemblies are of complete bird-proof construction; terminals have neoprene rubber caps, plus 5 kv insulated conductor for high-voltage connections.

Get Complete Information

Ask the L-M Field Engineer for information on features, design, and delivery on the new 50 kvar Elemex capacitors and capacitor equipments. Or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).



L-M's new 50 kvar capacitors in a NEMA standard hanger. The capacitor has the same width, same thickness as 25 kvar capacitor and 10 inches of additional height. The three units provide 150 kvar—50% more than four 25 kvar units.



Only 10 inches of additional height gives twice the capacity.

LINE MATERIAL

Elemex® Capacitors

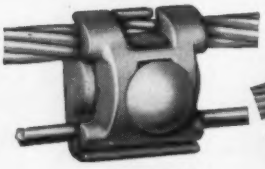
Reduce Inventory!

USE BLACKBURN'S PermaCad Aluminum Fittings

CHECK THESE PLUS FEATURES

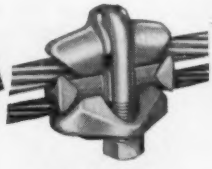
- All fittings may be used on either aluminum or copper conductors. Each fitting accommodates a wide range of wire sizes—few fittings are needed in stock or on trucks.
- Installation errors are eliminated on bi-metallic connections. Either groove will accommodate aluminum or copper conductors.
- Permacad fittings are available in one or two bolt parallel groove clamps—single and double U-bolt clamps. There's a fitting for every job.
- Grooves are contoured to surround conductor and provide large contact areas . . . improving conductivity.
- Non-copper-bearing, heat treated aluminum alloys used in all castings. Hardware available in either hot dipped galvanized steel or high strength aluminum alloy. Bolts alumilited to prevent seizing.

* **PERMACAD** *is a complex, heavy duty plating of cadmium and other metals which has exceptionally long life. PERMACAD protects aluminum because of its favorable electrogalvanic potential and is highly resistant to galvanic corrosion when in contact with copper.*

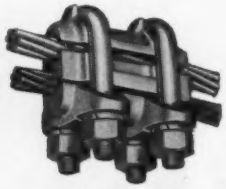


PGP SERIES
One bolt parallel groove clamp. Three fittings accommodate wire ranges from 8 AWG to 397.5 MCM.

PGP 400 SERIES
Two bolt parallel groove clamp. One clamp accommodates conductors from 1 str to 400 MCM.



DLC GP SERIES
Single U-bolt clamp. Four clamps accommodate wire range from 6 AWG to 266.8 MCM.



2U GP SERIES
Double U-bolt clamp. Six clamps accommodate conductors from 1 str to 397.5 MCM.

BLACKBURN *Permacad* **FITTINGS**

IMPORTANT: We recommend the use of CONTAX on all aluminum and bi-metallic connections. CONTAX is an oxide inhibiting compound with an ASTM drop point in excess of 500° F.

AVAILABLE THROUGH ELECTRICAL DISTRIBUTORS EVERYWHERE

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What Will They Read?

Kansas City P&L analysis finds employees favor inspirational, do-it-yourself themes; spurn economics and patriotic subjects

HOWARD L. BRICKEY, Editor, Advertising & Publicity Department, Kansas City Power & Light Co

A study of the reading tastes of employees of Kansas City Power & Light Co has provided some interesting and unexpected results. For one thing, it shows that employees are highly selective in what they want to read. For another, there was a surprisingly lack of interest in certain types of factual material in which they could well have been expected to show some interest.

The study was on the basis of what employees took from a reading rack service, offering free pamphlets on a wide range of subjects. It was given a one year's trial in the company's general office building.

Results of the trial rack were exceedingly gratifying from the standpoint of employee interest, with 2,500 pieces of literature picked up each month. This popularity of the service has led the company to introduce the racks elsewhere and to make the service available for all the 2,700 employees. It is now expected that the monthly total of pamphlets taken will jump to 6,000.

Free Booklets Popular

Free literature, if it is the right kind, is popular with employees. But it must command their interest, or it stands no chance of ever getting out of the rack.

The most interesting aspect of the trial run was the revelation of what subjects employees are eager to read about. Depending on observers' various viewpoints, results of the trial could be evaluated as either shocking or casually normal.

Anyway, readers were most concerned with self-interest, with information pertaining to them personnally, as revealed by statistics on the number of pamphlets picked up in this category.

Inspirational and religious pieces were grabbed up quickly and were more popular than any other kind of material offered. After these, information on self-improvement came next. The third most popular category was hobbies, information on how-to-do-it in an almost limitless field of endeavor.

The popularity of the personalized subjects perhaps is not too startling. But many observers may be jolted to learn of the low regard readers had for certain other subjects of real importance.

The slowest mover on the rack was any booklet dealing with economics, the capitalistic system, or industry in general. The field of business ranked absolutely last. This is all the more remarkable because of the potential clientele for pamphlets on those subjects was entirely office workers—clerical and professional people. A booklet entitled, "The Electric Industry," remained on the rack for weeks and attracted very few takers.

One possible explanation for the failure of the booklet to move is that most potential readers already had more information about the electric industry than the booklet offered.

Probably more to the point, however, is the low esteem in which economic information is held. "What Is Automation?" fell flat. A discussion on capitalism, "Your Future and You," took four days on the rack to lure its first reader.

Ranking next to the bottom in appeal was patriotic material, probably for reasons similar to those pertaining to the electric industry booklet. Feeling no lack of patriotism, most persons may have decided they already knew everything there was to know on the subject.

For whatever reason, they didn't pick up patriotic material. An excellent essay, "I Speak for Democracy," went begging as did a similar pamph-

let, "Adventure in America." Fifty copies of, "Communism in the United States," placed on the rack found only ten takers at the end of a week.

Even more inexplicable was the high regard for articles on health and medicine as compared with the almost total neglect of literature on safety.

The fact that readers jumped for articles on bodily exercise, diets for health, care of the heart and eyes and feet yet spurned information on safeguarding life and limb from accidents came as quite a surprise.

If these results of the trial reading rack give an indication of employees' reading tastes generally and of the relative importance readers assign to various topics, some interesting questions immediately pop up.

Are Readers Satiated?

Has too much already been put out about democracy and our freedoms, about the capitalistic system and the American economy, about careful walking on the street and driving on the highway? Have printing presses, broadcasting and television networks, billboards, and platform speakers satiated everybody's appetite for such information?

It would seem, at any rate, that it is becoming increasingly difficult to get across with those messages if we are to take the reading rack survey as a criterion. This is a matter that will require further research if companies want to ensure that employees voluntarily read certain material that will help them.

The heaviest demand for any single pamphlet was for a religious piece, "Your Prayers and Mine." Three hundred copies were picked up during the first two days it appeared, and some 1,200 copies were thus distributed before demand tapered off. In the same vein, "How to Read the Bible," was immensely popular.

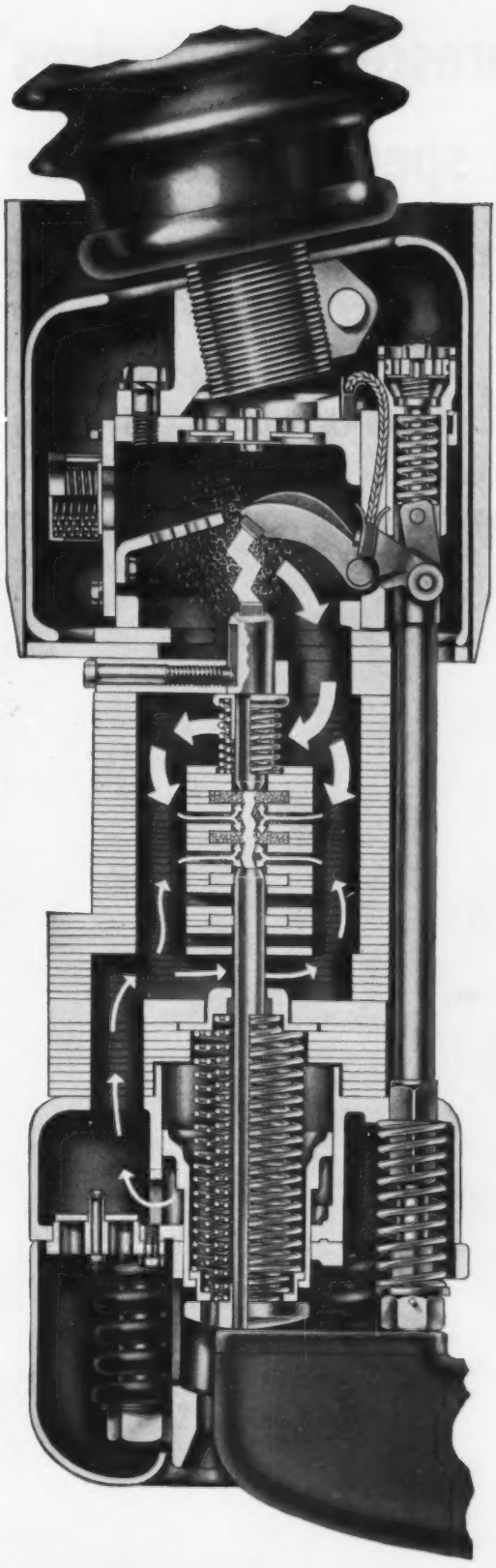
Inspirational pieces also were "best sellers." Elbert Hubbard's "A Message to Garcia," was the second best phamphlet offered during the test run. Also on the fast mover list was Edward R. Murrow's "This I Believe."

Self-Improvement Favored

The rack revealed a universal zeal for self-improvement. Articles on manners and customs, how to win friends and influence people, how to care for clothes and improve appearance went over big. A discussion of personality and appearance entitled, "Ticket to Friendship," was sure-fire. So was, "The Clothes You Wear to Work."

Booklets on how-to-do-it more than held their own and were in greatest variety. These pieces clicked every time, whether they dealt with knitting, pitching horseshoes, how to sprinkle a lawn, how to train a dog, or how to care for pets.

The fact that the reading racks can help in fulfilling the demand for literature that is uplifting and can assist in improving the individual is ample justification of the program expense. Any broadening of the individual and boosting of his pride certainly is worthwhile.



No other interrupter offers all this

Greater system stability . . . duration of faults is sharply limited, thus keeping them from lowering effective machine voltages and reducing synchronizing power. The result is better service continuity.

Shorter arcing time . . . plenty of fresh oil is brought across the entire arcing path, cooling the arc and removing ionized gases. Insulation is increased so that the arc cannot re-establish itself after current zero.

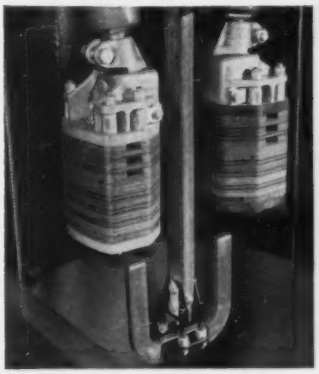
Reduced arc energy . . . arcing time and arc length are reduced. An arc so restricted has low arc voltage, low energy.

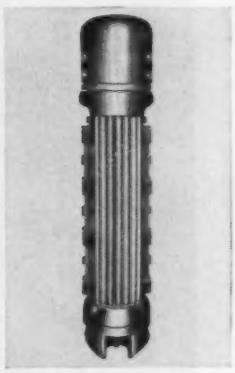
Lower maintenance . . . low arc energy during interruption limits oil carbonization and lengthens contact life. The entire grid is designed for easy, simplified inspection of contacts and parts without dismantling.

Longer oil life . . . carbonization is reduced, interruption quicker. "De-ion®" grid breakers maintain necessary insulating level through more interruptions than other types.

High-power laboratory tested . . . complete verification of all interrupting ratings.

Here is reliability that means freedom from the inconvenience and worry about faulty operation. De-ion grids have proved, through years of trouble-free service, that they can be depended upon to do their job quickly and efficiently. J-60889





Above is a cutaway view of the Multiflow grid showing the path of the oil in quenching the arc. The Multiflow grid is used on breakers rated 69 kv and above. At the right are the Magnetic and Tubular grids used in breakers rated 69 kv and below, and high capacity 138 kv and above, respectively. These grids have proved, in service, that they have no equals in efficiency and reliability.

WATCH WESTINGHOUSE!

*WHERE **BIG** THINGS ARE HAPPENING **TODAY!***

Westinghouse fluorescent luminaires' exclusive features speed installation and maintenance

Look what's new in Cleveland! A great white way of fluorescent light by Westinghouse 4FSL-72 street lighting luminaires. The change from the old system to the new was made in record time because Westinghouse units are designed for quick installation and simple maintenance. The importance of these advantages can be measured in real savings—savings in labor cost during installation and for the maintenance life of your street lighting system.

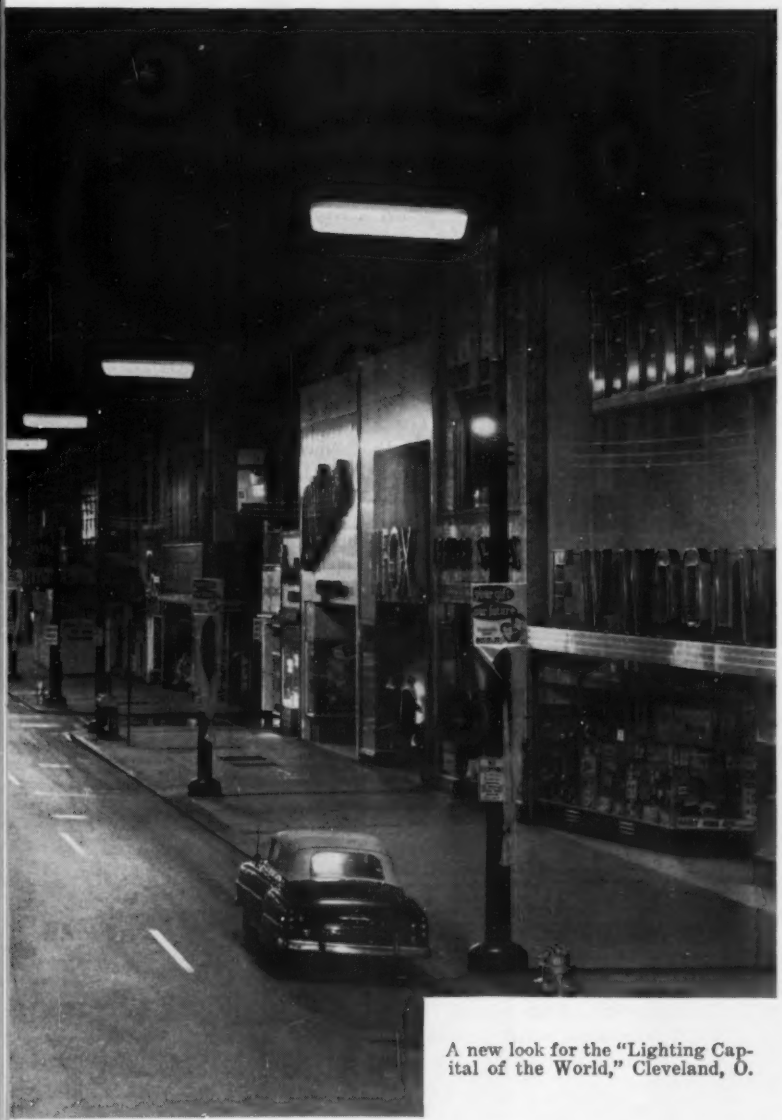
If you are planning a fluorescent street lighting program, examine these important features, and you will agree that the Westinghouse 4FSL-72 fluorescent luminaire is built for a lifetime of efficient, economical operation.

More information? See your nearby Westinghouse representative, or write Westinghouse Electric Corporation, Lighting Division, Edgewater Park, Cleveland, Ohio.

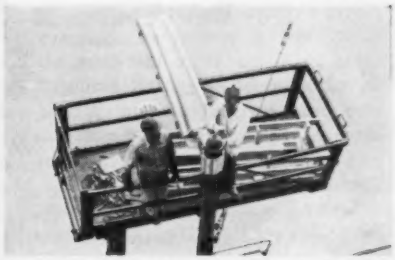
J-04390

WATCH WESTINGHOUSE

where **BIG** *things are happening for* **YOU**



A new look for the "Lighting Capital of the World," Cleveland, O.



Attaching luminaire to pole . . . is done by tightening four bolts on the heavy-duty mounting bracket. 4FSL-72 may be mounted horizontally or at a 15°-30° angle for wider light distribution.

Connecting wiring . . . three knurled nuts are loosened *without tools*, allowing reflector to hinge down for easy access to ballast and wiring. Wire is brought through watertight bushing; leads are then attached to terminal block.

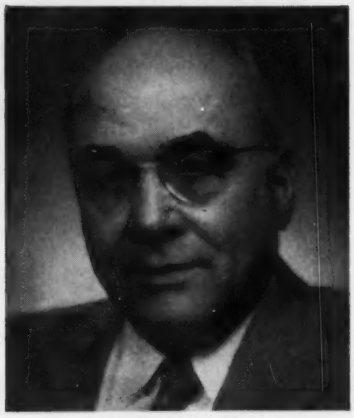
Closing luminaire after installation . . . cover may be opened or closed from either side by releasing three pressure latches. Cover is clear acrylic plastic which will not discolor with age. Fiber glass housing *never* requires painting.

Wisconsin Utility Makes Executive Changes

Gould W. Van Derzee, president of Wisconsin Electric Power Co for the past 11 years, has been elected chairman of the board of directors, and chairman of the executive committee and of the policy committee. Lawrence F. Seybold, executive vice president for the past nine years, has been elected company president.

As senior officer of the utility, Van Derzee will have general administration over all the fiscal affairs of the company, financing, stockholder relations, and insurance, as well as matters pertaining to public relations and employee welfare. He has been with the utility and a predecessor company since 1913, and since that time has served as assistant general manager, vice president and assistant general manager, and vice president and general manager. He was named president in 1945.

GOULD W. VAN DERZEE



LAWRENCE F. SEYBOLD

Seybold, in assuming the presidency, will be chief executive officer in charge of general operations of the company. Affiliated with the utility and its predecessor, Milwaukee Electric Railway & Light Co, since 1919, when he joined as junior engineer, he progressed to research engineer, operating research bureau head, and assistant vice president, and was named a vice president in 1938.

UGI Advances Brownlee to VP

James L. Brownlee has been appointed vice president of United Gas Improvement Co in charge of the Luzerne Electric & Gas Division to succeed Charles E. Warsaw, retired. Warsaw had held that post since 1953 when Luzerne County Gas & Electric Corp, of which he was president, became UGI's Luzerne Division.

Brownlee, at present manager of the electric distribution and gas department of the Luzerne Division, has been with UGI since his graduation from Pennsylvania State University in 1921. He started as an assistant engineer, and advanced to his most recent position in 1945.

JAMES L. BROWNLEE

Owens-Illinois Glass Elevates Two to Vice Presidential Posts

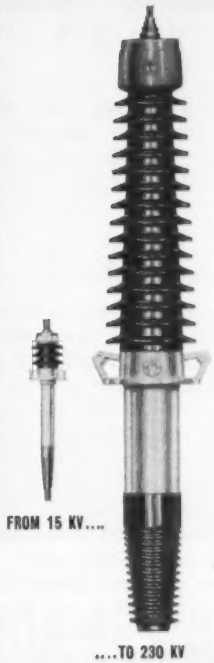
JOHN L. GUSHMAN

John L. Gushman, general manager of the International Division, and William J. Stewart, director of personnel administration, have been elected vice presidents of Owens-Illinois Glass Co.

Gushman came to Owens-Illinois in 1947 as counsel for the Glass Container Division, and in 1953 was named Administration Division vice president and director of administrative services. He was promoted to his present position earlier this year.

Stewart is also general manager of the Kaylo Division, a position he had held since 1953. Since joining O-I in 1930 he has also served as accountant, industrial engineer, budget supervisor, and chief industrial engineer for the Glass Container Division.

WILLIAM J. STEWART



NEW O-B BUSHING
Works all the insulation ...Overworks none of it

Every new O-B bushing, all the way from 15 to 230 kv, uses "full condenser" construction of the insulating core. Concentric foil layers, acting as plates, decrease in length as they increase in diameter in order to maintain uniform area. During the paper winding operation, spacing of these plates is held to a high degree of accuracy . . . In a condenser where plate area and dielectric spacing are equal, voltage is uniformly divided. In this way, the total bulk of insulation in the O-B bushing is worked efficiently; each dielectric zone taking an equal share of the voltage, and subjected to extremely conservative stress . . . This permits combining the slender form of O-B's new bushing with high operating reliability and generous safety factors at all voltage ratings . . . These bushings are now available for application to your new station equipment.

4642-H

Ohio Brass

MANSFIELD OHIO, U. S. A.

Corning Glass Elects Armistead, Hicks, Waterman VP's

Corning Glass Works has announced the promotion of three executives to the position of vice president. They are Dr William H. Armistead, director of the company's Research and Development Division; Dr John F. G. Hicks, general manager of the International Division; and R. Lee Waterman, general manager of the Consumer Products Division.

Before appointment to his most recent post in 1954, Armistead was manager of the Research and Development Division's melting department. He joined the company in 1941 as a research chemist and in 1951 became a senior research associate.

Hicks, who joined the company in 1938, was named first general manager of the International Division upon its formation in 1953.

Associated with the company since 1955 when he joined as Consumer Products Division general manager, Waterman is also vice president of the company's subsidiary, Corning Glass Works of Canada, Ltd.

DR. W. H. ARMISTEAD | DR. JOHN F. G. HICKS | R. LEE WATERMAN

PERSONAL BRIEFS

Charles Y. Freeman, chairman of the executive committee of Commonwealth Edison Co, plans to retire from active service May 15 but will remain a director.

William N. Thomas, engineer for Virginia Electric & Power Co, has been selected as one of 60 American and foreign applicants to participate in a nuclear training course at Argonne National Laboratory.

Niagara Mohawk Power Corp has named **J. Norton Ewart,** formerly chief mechanical engineer, as assistant chief system project engineer. He is succeeded by **Raymond P. Moore.** In other company promotions **Harold G. Hunt** was advanced to chief design engineer and **Philip D. Freudenberger** becomes steam station design engineer.

New England Electric System changes include promotion of **Edward M. Keith** as superintendent of production for Worcester County Electric Co and appointment of **Howard G. Lasselle** as system distribution engineer for New England Power Service Co.

Lawrence B. Jack, formerly industrial relations director for British Columbia Electric Co, Ltd, has been named director of budgeting and control. Moving into Jack's position will be **John J. Carson** of Ontario Hydro-Electric Power Commission.

J. Duane Gorman has been appointed to succeed retiring **W. Grady Whitman** as manager of Monongahela Power Co's Elkins Division.

Recent promotions in the marketing research and product planning component of General Electric Co's Large Steam Turbine-Generator Department include **Roy C. Buell** as systems product planner; **Richard K. Hamlin,** specialist, marketing research; **Donald W. Krauter,** product planner; **Nicholas B. Milano,** analyst-marketing research; and **John C. Chew,** analyst-price formulation.

Monsanto Chemical Co has designated **Frederick W. Enoch** manager of the electrical and instrumentation section of Organic Chemicals Division's engineering department. He replaces **William J. Katt,** transferred to the automatic process control group of Research & Engineering Division's engineering department.

Bryant Electric Co, wholly owned subsidiary of Westinghouse Electric Corp, has named **J. J. Schwing, Jr,** as plant superintendent to head operations of its new facility in Danielson, Conn.

George M. Stapleton has been elected vice president and manager of dimmer sales of Ward Leonard Electric Co to succeed **A. W. Borghard** who retires from these posts.

J. L. Wagoner is new director of industry relations for Federal Pacific Electric Co . . . Miller Co has named **John J. Neidhart** as applications engineer, Illuminating Division . . . Recently elected manager of market research for Hotpoint Co was **W. Sten Peterson.**

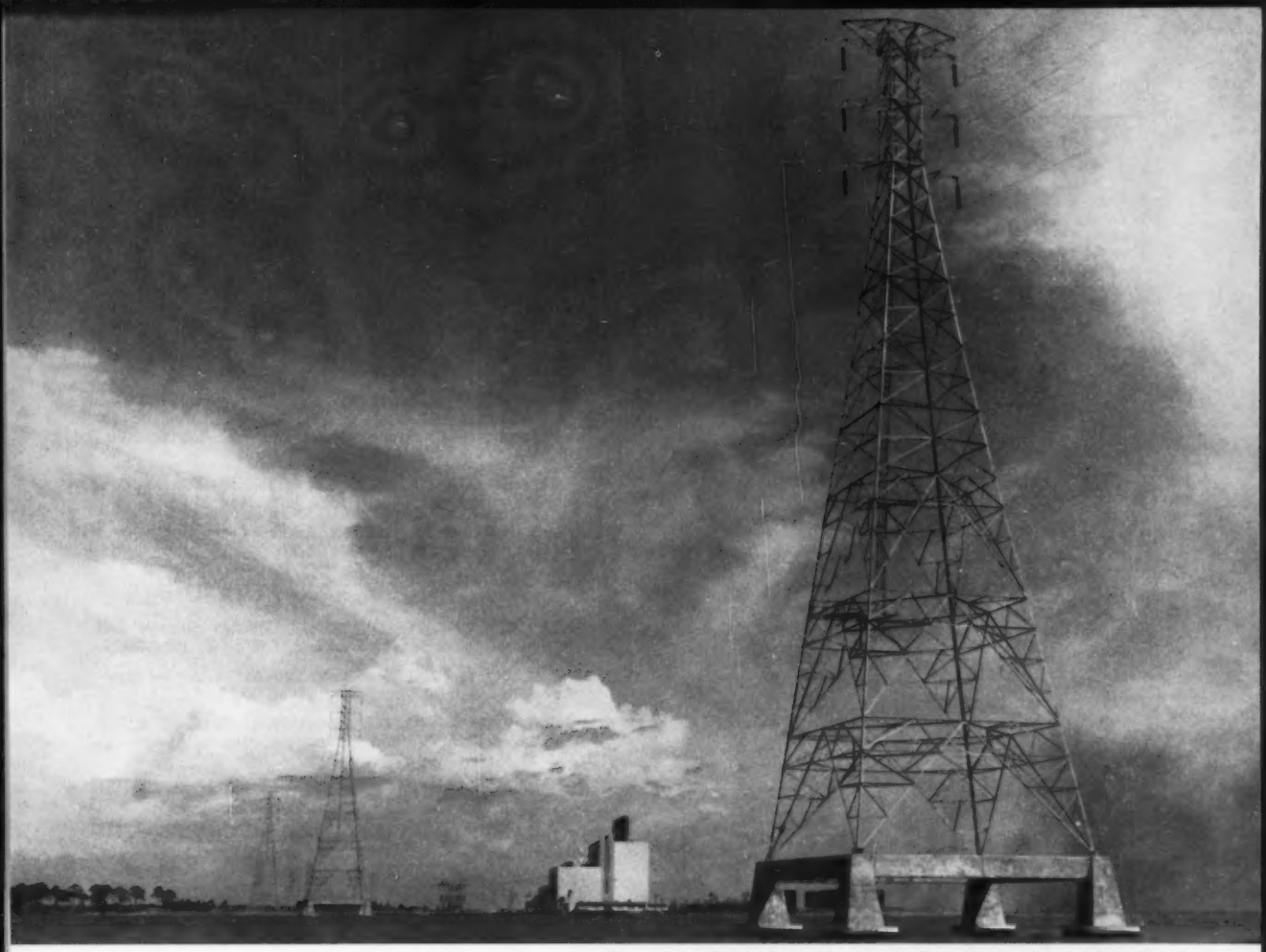
Graybar Electric Co, Inc, has announced the retirements of **L. F. Fields,** Richmond district manager and company director, and **Herbert Metz,** Eastern district manager, trustee, and member of the executive committee.

L. J. Dusenbury, has been appointed by Western Precipitation Corp to head its Proposal and Contract Department.

Promotion of **Lauren L. Morin** to division engineer, electrical products group, and **John E. Cahill** to assistant division engineer, has been announced by Minnesota Mining & Manufacturing Co.

Brown Co's **Dr. George A. Day,** director of research since 1944, has been appointed to the newly created position of technical director. **Douglas H. McMurtrie** is new director of research.

H. A. Erb, division engineer in Elliot Co's compressor division, has been appointed works manager of the steam division at Jeannette, Pa.



Towers designed and fabricated by American Bridge Division of United States Steel for Florida Power Corporation. Erected by Southeastern Utilities Service Company, Miami, Fla.

26 tons of weight saved by USS MAN-TEN Steel saves $7,200 in erection costs

Because power transmission towers are frequently installed in locations far removed from regular means of transportation, every pound saved reduces shipment and erection costs.

The four towers crossing Old Tampa Bay from the Florida Power Corporation's Higgins plant forcibly illustrate this fact. These towers, built 198 ft. high to provide a 100 ft. clearance over mean low water, had to be designed to resist hurricane force winds of 135 mph, with an overload capacity factor of 1.25.

The high strength required was readily obtained by using USS MAN-TEN* Steel rather than plain carbon steel in the tower legs. At the same time, because of MAN-TEN's high yield point of 50,000 psi, it was possible to reduce weight of legs by 26 tons. This considerable saving in steel tonnage reduced the cost of the towers even though USS MAN-TEN Steel costs a little more.

The big saving, however, was in cost of erection.

There were two different rates involved; one for erection over water and one for erection on land. 6½ tons were trimmed from each of the three towers erected over water, resulting in a $6,000 saving. The tower erected on land weighed 6 tons less, providing an additional $1,200 saving—or a total erection cost saving of $7,200.

If you are looking for construction that will save money for you by reducing weight, prolonging life and minimizing maintenance—at little or no increase in first cost—find out more about USS High Strength Steels—USS MAN-TEN, USS COR-TEN and USS TRI-TEN. You'll find our 174-page "Design Manual for High Strength Steels" extremely useful in applying these steels. For free copy write—on your company letterhead—to United States Steel Corp., Room 5258, 525 William Penn Place, Pittsburgh 30, Pa.

UNITED STATES STEEL CORPORATION, PITTSBURGH · AMERICAN STEEL & WIRE DIVISION, CLEVELAND · COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
NATIONAL TUBE DIVISION, PITTSBURGH · TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. · UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS HIGH STRENGTH STEELS

USS MAN-TEN · USS COR-TEN · USS TRI-TEN

USS

6-672

UNITED STATES STEEL

MEETINGS CALENDAR

MAY

EDISON ELECTRIC INSTITUTE—Purchasing & Stores Committee, Sheraton Plaza Hotel, Boston, Mass., May 7-9; Commercial Electric Cooking Conference, Sheraton Hotel, Chicago, Ill., May 8; Transportation Committee Meeting, jointly with AGA, Congress Hotel, Chicago, Ill., May 8-11; Industrial Relations Committee, Willis E. Hughes Memorial, Rochester, N. Y., May 17; Orientation Meeting, jointly with AGA, Headquarters, New York, New York, May 21.

PENNSYLVANIA ELECTRIC ASSOCIATION—System Planning Committee, Hotel Alexander, Hagerstown, Md., May 7-8; Transmission and Distribution Committee; Skytop Lodge, Skytop, Pa., May 10-11; Communications Committee, Nittany Lion Inn, State College, Pa., May 14-15; Relay and Electrical Equipment Committees, Hotel Roosevelt, Pittsburgh, May 17-18; Industrial Sales Conference, Galen Hall, Wernersville, Pa., May 17-18; Annual Accounting Conference, Warwick Hotel, Philadelphia, Pa., May 21-22; Systems Operations Committee, Bedford Springs Hotel, Bedford, Pa., May 24-25.

AIR-CONDITIONING & REFRIGERATION INSTITUTE—Annual Meeting, The Homestead, Hot Springs, Va., May 7-9.

AMERICAN WELDING SOCIETY—Fourth Welding Show, Memorial Auditorium, Buffalo, N. Y., May 9-11.

ATOMIC INDUSTRIAL FORUM, INC—Hotel Plaza, San Antonio, Texas, May 10-11.

NORTHWEST PUBLIC POWER ASSOCIATION, INC—Engineering & Operations Section, Cascadian Hotel, Wenatchee, Washington, May 10-11.

PUBLIC UTILITIES ADVERTISING ASSOCIATION—Annual Convention, Philadelphia, Pa., May 10-11.

INTERSTATE POWER CLUB—Hotel Martinique, New York City, N. Y., May 14.

PACIFIC COAST ELECTRICAL ASSOCIATION—Annual Convention, Las Vegas, Nevada, May 14-16.

PETROLEUM ELECTRIC POWER ASSOCIATION—28th Annual Convention, Robert Driscoll Hotel, Corpus Christi, Texas, May 14-16.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS—Design Engineering Conference, concurrent with Design Engineering Show, Convention Hall, Philadelphia, Pa., May 14-17.

ILLINOIS INSTITUTE OF TECHNOLOGY—Industrial Nuclear Technology Conference, Museum of Science & Industry, Chicago, Ill., May 15-16.

GREAT LAKES POWER CLUB—Wagon Wheel Hotel, Rockton, Ill., May 17-18.

NEW YORK STATE SOCIETY OF PROFESSIONAL ENGINEERS—30th Engineering Industries Exposition with Annual Convention, Statler Hotel, New York City, May 17-19.

INDUSTRIAL HEATING EQUIPMENT ASSOCIATION, INC—Spring Meeting, The Homestead, Hot Springs, Va., May 20-23.

NORTHWEST ELECTRIC LIGHT & POWER ASSOCIATION—Business Development and Personnel Section Meeting, Benjamin Franklin Hotel, Seattle, Wash., May 21-23.

AMERICAN MANAGEMENT ASSOCIATION—General Management Conference, Hotel Roosevelt, New York City, May 23-25.

NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS—Annual Meeting, Ambassador Hotel, Atlantic City, New Jersey, May 23-26.

CIGRE—16th Annual International Conference, Paris, France, May 30-June 9.

JUNE

EDISON ELECTRIC INSTITUTE—24th Annual Convention, Traymore Hotel, Atlantic City, N. J., June 4-6.

NATIONAL ASSOCIATION OF ELECTRICAL DISTRIBUTORS—48th Annual Convention, Ambassador & Chelsea and Ritz Hotels, Atlantic City, N. J., June 11-14.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS—Semi-Annual Meeting, Statler Hotel, Cleveland, Ohio, June 17-21.

AMERICAN SOCIETY OF TESTING MATERIALS—59th Annual Meeting & 12th Apparatus Exhibit, Chalfonte-Haddon Hall, Atlantic City, N. J., June 17-22.

FIFTH WORLD POWER CONFERENCE—Vienna, Austria, June 17-23.

CANADIAN ELECTRICAL ASSOCIATION, INC—66th Annual Convention, Manoir Richelieu, Murray Bay, Quebec, June 18-20.

NORTHWEST ELECTRIC LIGHT & POWER ASSOCIATION—Accounting & Business Practice Section, Multnomah Hotel, Portland, Oregon, June 21-23.

PUBLIC UTILITIES ASSOCIATION OF THE VIRGINIAS—Accident Prevention Committee Conference, Hotel Roanoke, Roanoke, Va., June 22.

WISCONSIN UTILITIES ASSOCIATION—Accounting Section Convention, Schwartz Hotel, Elkhart Lake, Wis., June 24-26.

MICHIGAN ELECTRIC ASSOCIATION—Annual Convention, Grand Hotel, Mackinac Island, Mich., June 24-27.

ATOMIC INDUSTRIAL FORUM INC—Conference sponsored jointly with Denver Research Institute, Denver, Colo., June 25-26.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS—Summer and Pacific General Meetings, San Francisco, California, June 25-29.

AMERICAN SOCIETY FOR ENGINEERING EDUCATION—Annual Meeting, Iowa State College, Ames, Iowa, June 25-29.

AMERICAN CHIEF ENGINEERS' ASSOCIATION—Northwest Power Show, Minneapolis Auditorium, Minneapolis, Minnesota, June 28-July 1.

JULY

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION—Council Meeting, Geneva, Switzerland, July 16-21.

NATIONAL ASSOCIATION OF RAILROAD AND UTILITIES COMMISSIONERS—Annual Convention, Sheraton Palace Hotel, San Francisco, Calif., July 24-27.

COLUMBIA UNIVERSITY INDUSTRIAL & MANAGEMENT ENGINEERING DEPARTMENT—Fifth Annual Utility Management Workshop, Arden House, Harriman, New York, July 29-Aug. 10.

SEPTEMBER

NORTHWEST PUBLIC POWER ASSOCIATION, INC—Accounting Section, Cascadian Hotel, Wenatchee, Wash., Sept. 11-14.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS—3rd Annual Electrical Conference of the Petroleum Industry, Kansas City, Mo., Sept. 12-14.

PUBLIC UTILITIES ASSOCIATION OF THE VIRGINIAS—38th Annual Meeting, Greenbrier Hotel, White Sulphur Springs, W. Va., Sept. 14-15.

EDISON ELECTRIC INSTITUTE—Industrial Relations Round Table Conference, Drake Hotel, Chicago, Ill., Sept. 17-19; Meter & Service Committee, Purdue University, Lafayette, Indiana, Sept. 24-26.

ILLUMINATING ENGINEERING SOCIETY—National Technical Conference, Hotel Statler, Boston, Mass, Sept. 17-21.

INSTRUMENT SOCIETY OF AMERICA—11th Annual Instrument-Automation Conference and Exhibit, New York Coliseum, Sept. 17-21.

ATOMIC INDUSTRIAL FORUM, INC—3rd Annual Forum Conference and 2nd Annual Trade Fair, Morrison Hotel and Navy Pier, Chicago, Ill., Sept. 24-28.

PENNSYLVANIA ELECTRIC ASSOCIATION—Annual Meeting, Hotel Wm. Penn, Pittsburgh, Pa., Sept. 25-26.

ELECTRIC COMPANIES PUBLIC INFORMATION PROGRAM—Workshop Conference, Blackstone Hotel, Chicago, Ill., Sept. 26-28.

LOWER COSTS per installed kvar

with Sangamo's NEW 50 kvar Diaclor Capacitor

Better weight distribution in less space enables more Kvar per pole. You get lower installed costs per Kvar for capacitor banks through more economical use of poles, racks, installation materials and time. Savings in switching and protective equipment are also realized.

The coupon below will bring you Bulletin 1121 with complete specifications on Sangamo's 25 and 50 Kvar Capacitors.

New, multi-petticoat solder-sealed bushings make a strong and permanent hermetic seal. Pressure compensating stainless steel lock washers and tin-plated terminal parts facilitate quick and permanent connections with either copper or aluminum conductors.

SANGAMO

SANGAMO ELECTRIC CO.

SPRINGFIELD, ILLINOIS

Please send your new Bulletin 1121 ☐. Also send Bulletin 1120, with the full Sangamo Power Capacitor story ☐.

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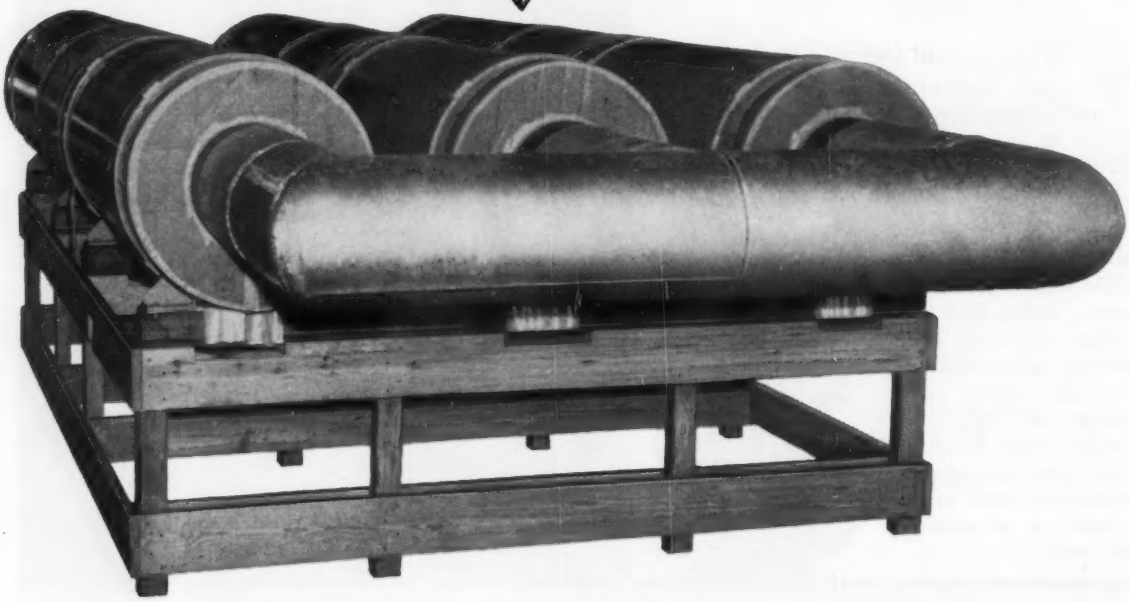
PC56-3

First 10,000 amp **self-cooled** isolated phase bus ever built

I-T-E 10,000 amp self-cooled isolated phase bus in laboratory for thermal test.



. . . design eliminates auxiliary forced-air cooling equipment

Now you can get heavy current isolated phase bus of this rating and above without having to buy and maintain auxiliary equipment to cool it.

I-T-E design includes:

- All aluminum conductors
- Connectors—bolted or field welded
- Covers—telescoping type; split halves, bolted or field welded

For more complete information, write Switchgear Division, I-T-E Circuit Breaker Company, 19th and Hamilton Sts., Phila. 30, Pa.

I-T-E CIRCUIT BREAKER COMPANY • Switchgear Division

Industry Leaders Must Be Community Leaders

Southwest Electric Conference told intellectual and political tasks must be accepted as part of responsibility of management

A. C. INMAN

"Groups who do not practice politics in the 20th century are courting political suicide." This sage comment was made to the Southwest Electric Conference by Frank R. Barnett, director of research, The Richardson Foundation, Inc. He pointed out that "America is now a 'business society' which is pitted against the conspiratorial society of communism; and as the front is everywhere, America's private leadership must be trained to assume responsibility for intellectual and moral 'civil defense' at the community level."

Barnett voiced the opinion that companies should think in terms of having a vice president of public affairs who could devote full time to active participation in the moral, intellectual, and political activities of our democratic society.

Barnett's speech was part of the program held April 15-17 at Chandler, Ariz. R. K. Lane, president, PS of Oklahoma, was elected chairman of the executive committee to succeed C. A. Tatum, president, Dallas P&L. Other presidents on the committee are W. A. Parish, Houston L&P; W. T. Lucking, Arizona PS; M. L. Kapp, Interstate Power; D. E. Ackers, Kansas P&L; and D. W. Reeves, PS of New Mexico.

A. J. G. PRIEST

Remarks of other speakers follow:

A. J. G. Priest
Professor Utility Law, University of Virginia

The subsidies to industrial companies by the Tennessee Valley Authority were attacked by Priest. He pointed out that large industrial companies are buying power at between 3.36 and 4.18 mills per kwhr while federal agencies are paying TVA an average of 4.73 mills. He compared this to an average tax per kwhr of 5.3 mills paid by the Pacific Gas & Electric Co. "It is hard to understand," he said, "why the U. S. Steel Co should be assessed taxes to subsidize aluminum production in the TVA area."

Mark W. Cresap, Jr
Executive Vice President, Westinghouse Electric Corp

Reporting on the recent strike, Cresap told the group that Westinghouse achieved its main objective and retained the right to operate the company. He said the loss of employees was negligible and less than would normally have been expected had the strike not occurred. He reported production to be above expectations, organizational spirit to be at a new high, and extensive promotional programs.

A. C. Inman
Vice President, Idaho Power Co

How federal power advocates are misrepresenting the relative merits of the two plans for development of Hells Canyon was explained by A. C. Inman. He pointed out that these groups were claiming 924,000 kw for the government dam and 505,000 kw for the Idaho Power Co's dams. Dependable capacity as found by the FPC was 767,000 kw for the company's dams and 785,000 kw for the government dam.

The current estimate of cost of the two projects was given as $399 million for the government dam and $133 million for the company dams.

Robert M. Feemster
Chairman of Executive Committee, Wall Street Journal

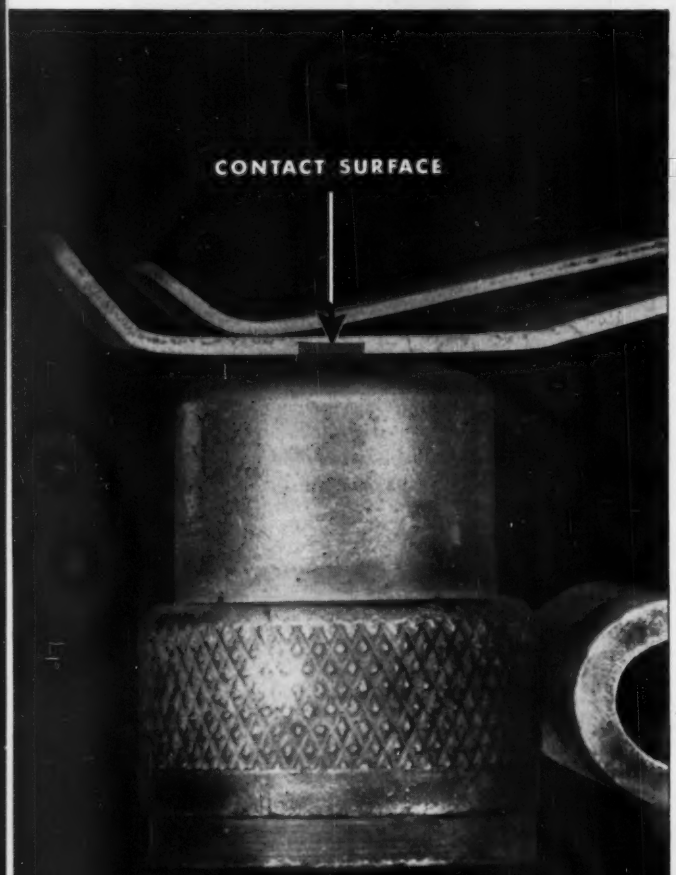
Feemster evaluated the current public sentiment as being extremely hopeful and optimistic, more so than even before, and on a sounder basis. He said that "if we do have a strong, hopeful, assured public feeling, we are in the best position. The greatest thing that has happened since 1929 is that we have learned how to buy things and use them at the same time." Feemster added, "And consumer credit is a good thing when held under control."

In discussing the business situation as a whole, Feemster said, "Increased money rates should be considered the best sign of prosperity. It is much better than having ample funds. We may be able to hold down inventories industry by industry. Perhaps through being better informed, we can do a better job. But the man who knows how much to produce at any time has never been born."

J. E. Corette, president, Montana Power Co, spoke off the record.

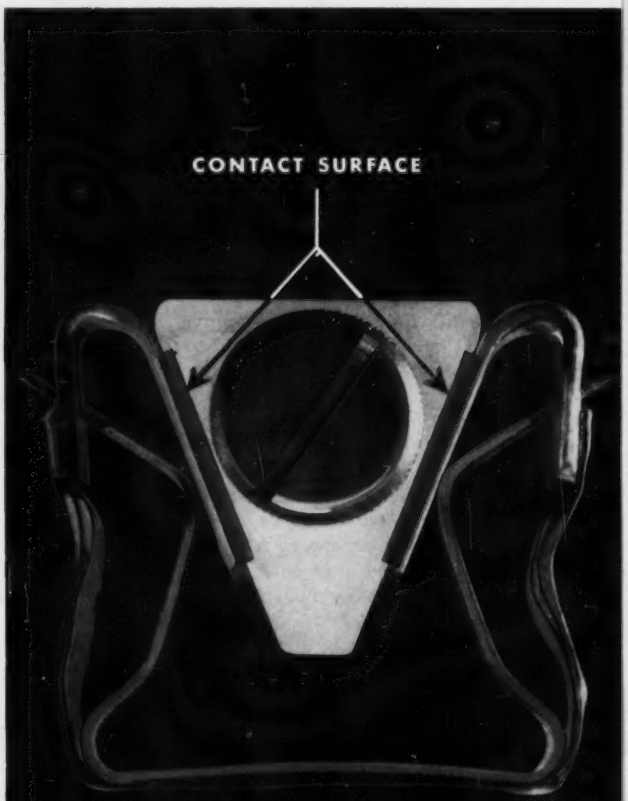
old

Ball-point contacts hit on only one spot. Can result in pitting, wear, corrosion—and possible overheating.



new

"V"-wedge contacts line up solidly, both sides . . . make for a high-pressure, multi-point, low-resistance contact.



ALL-NEW ENCLOSED FUSE CUTOUTS

now...

Self-aligning 'V'-wedge contacts have multi-point contact surfaces, add years to cutout life

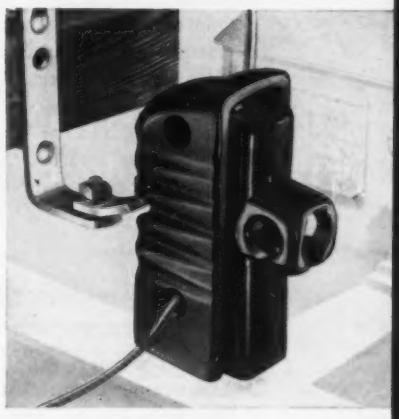
Cutout life is extended in General Electric's all-new Enclosed Fuse Cutout line because of this unique construction which gives positive high-pressure, multi-point, low-resistance contact. In addition, these exclusive "V"-wedge contacts are free-floating and self-aligning—to assure you of positive contact every time. Broad surfaces of contacts are silver plated to protect against corrosion and maintain low resistance.

EVEN AFTER YEARS OF SERVICE, the faces of these "V"-wedge contacts stay bright, clean, shiny. Resistance is kept low—and cumulative overheating doesn't even get a chance to cause an outage.

In old-style contacts, pitting, arcing and overheating could result from single-point contact—G.E.'s completely new "V"-wedge contacts eliminate these difficulties.

EVERYTHING IN ONE LINE—G.E.'s new Fuse Cutout line gives you all functions—indicating-dropout, indicating-non-dropout, disconnect—in one basic design. You get two current ratings, 50 and 100 amperes, and two voltage ratings, 5.2 and 7.8 kva, to match every possible system demand.

LINEMEN WILL LIKE the other new features of the new G-E Fuse Cutout line. The safety-grip door handle, for instance, that ends switch-stick juggling—and the unique plastic-to-metal latching that prevents door "freezing." In addition, fusing and line connecting have been made extra easy for fastest possible installation and servicing. For a complete description of the new cutout line, write for Bulletin GEA-6208, General Electric Company, Section 433-13, Schenectady 5, New York.



THIS NEW G-E FUSE CUTOUT

has all the features most engineers and linemen prefer. Logically so, too—hundreds of reports of the features they wanted were collected and evaluated. Their best ideas were incorporated into the new cutout design.

Progress Is Our Most Important Product

GENERAL ELECTRIC

JCP&L Raritan Plant Cited for Safety

Norwood S. Burky, right, superintendent of Jersey Central Power & Light Co's Raritan River generating station at Sayreville, accepts General Public Utilities Corp President's Plaque on behalf of plant employees. This plant established the best safety record in 1955 among GPU subsidiary plants of the same class based on number of employees (75 or more).

Offering congratulations (l to r) are: Clyde A. Mullen, vice president in charge of operations, Jack O. Leslie of Gilbert Associates, safety consultants for JCP&L, and Russell W. Aul, safety director.

The Raritan River station, together with the E. H. Werner station, South Amboy, and the Whippany station in the company's Northern Division, also was awarded a GPU honor certificate for having completed 1955 without a lost-time injury.

LABOR BRIEFS

Strike of 170 employees at the 210,000 kw steam plant of Montaup Electric Co over a contract seniority clause which began April 16 was ended April 25 without interruption of service. A 6.1% wage increase retroactive to March 16 and a further 3% rise effective a year later has been signed by the company and the Utility Workers Union of America.

Polytechnic Institute of Brooklyn has reported that 1,300 of its 3,900 evening students are getting financial aid from employers who are seeking to build up engineering and scientific personnel.

Cleveland Electric Illuminating Co employees have reached two million-manhour mark without a lost-time injury anywhere in the company, it was announced recently. This is the first time that the multi-million-manhour level has been reached on a company-wide basis.

Engineer Shortage

. . . prompts 5 firms to set up professorial chair in systems engineering at Illinois Tech

Five companies associated with the electric industry have united to establish a professorial chair in electric power systems engineering at Illinois Institute of Technology, it was announced recently by Dr John T. Rettaliatta, president of the Institute.

The five companies participating in the program are: Allis-Chalmers Manufacturing Co, American Gas & Electric Co, Commonwealth Edison Co, Illinois Power Co, and the Westinghouse Electric Corp.

Demand For Engineers Stressed

In making the announcement, Dr Rettaliatta said:

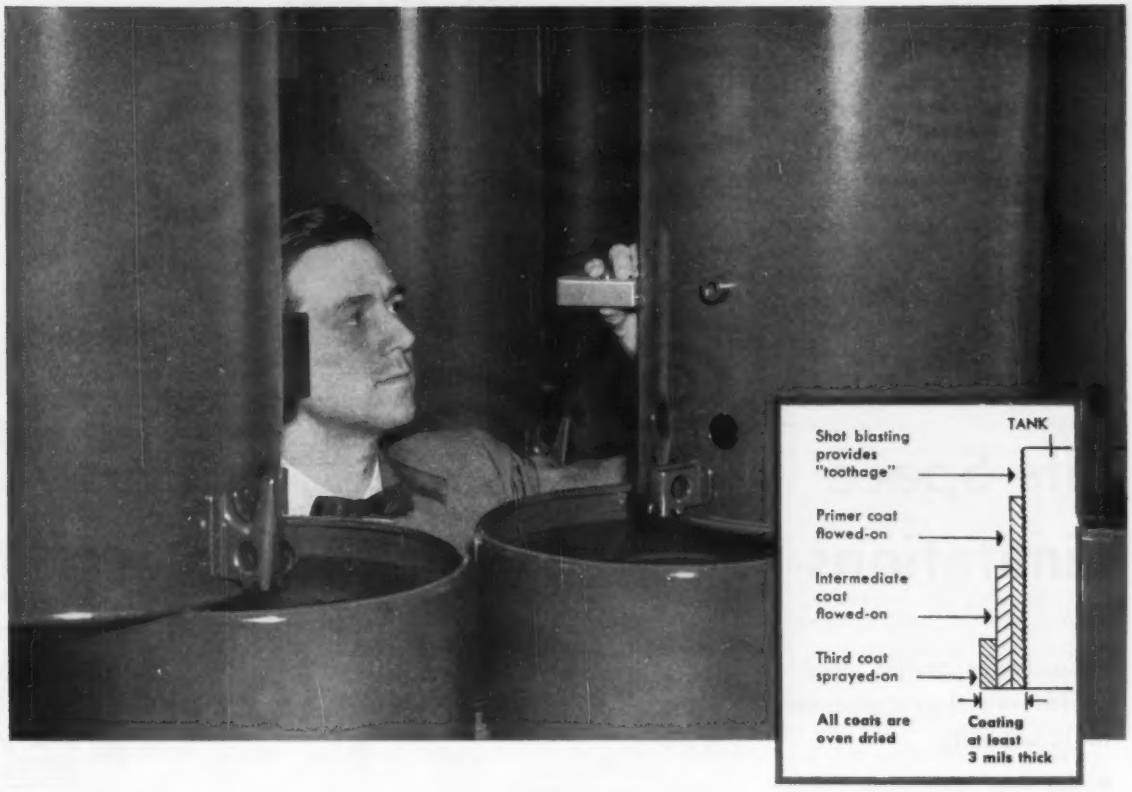
"It is the earnest belief of the sponsoring companies and the Illinois Institute of Technology that if rapidly expanding demands of the nation for electricity are properly to be met in the future it will be necessary to bring more bright and capable students into the electric power field.

"We need to do more," he continued," to awaken students to the dynamic character of the electric power industry and to its challenges and opportunities.

This can best be done in our engineering schools by teachers who understand and believe in the important role that engineers entering this field can play in its development; who believes the field affords unique opportunities for capable students, and who can stimulate and inspire such students," declared Dr Rettaliatta.

Dr William Abbett Lewis, Jr, formerly dean of the graduate school at Illinois Tech, has accepted appointment to the chair, which will be made an integral part of the program of the Institute's department of electrical engineering.

Dr Lewis came to the Institute in 1944 as a research professor of electrical engineering and since 1946 has been its graduate division dean. He was a central station engineer for Westinghouse Electric until 1929 when he was appointed director of the department of electrical engineering at Cornell University.



He's taking the "whether" out of weather...by checking paint thickness on POLE STAR tanks

For effective, long-term protection of transformer tanks during outdoor service, paint thickness of at least 3 mils (0.003 in.) is recommended by paint experts. Pennsylvania Transformer Company has set up a rigidly controlled triple-coat painting process which, in itself, insures that every Pole Star distribution transformer is given a high quality coating that satisfies this requirement. As a final check, however, tanks are tested with an Elcometer, a magnetic device for measuring the thickness of paint on metal — an "extra precaution" that typifies Pennsylvania's insistence upon the highest possible quality.

The paints used on Pole Stars have passed the severest weathering tests, both in the laboratory and in the field. Tank surfaces are thoroughly shot-blasted with steel grit to remove all scale, grease and dirt, and to provide "toothage" for the all-important primer coat. Paint viscosity — an important factor in coating thickness — is checked constantly. The primer and intermediate coats are applied by the flow method for heavy, uniform coverage, and the final coat is sprayed-on to insure a smooth finish with a maximum gloss. Each coat is oven-dried before the next coat is applied.

PENNSYLVANIA GRAY-SPRAY TOUCH-UP PAINT

in easy-to-use pressurized spray cans now is available at nominal cost. Keeping a small supply on hand will facilitate the minor touch-up jobs necessitated by surface damage during installation or other handling.

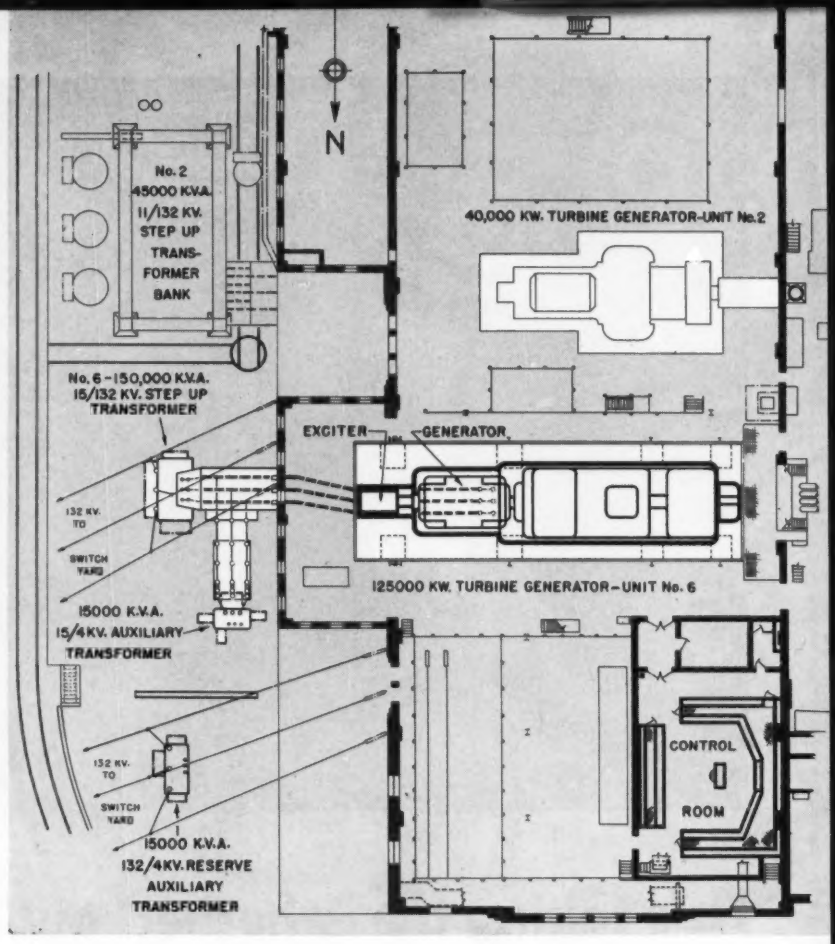
POLE STAR pt

167 Production Controls make POLE STARS best!

PENNSYLVANIA TRANSFORMER COMPANY

A McGraw Electric Company Division CANONSBURG, PA. *Greater Pittsburgh District*

Pole Star Transformers are available in all standard single phase distribution sizes from 3 through 500 kva, through 67,000 volts.



PLAN VIEW shows new 125-Mw turbine-generator in space vacated by old 40-Mw unit. Adjacent No. 2 is same size and rating as removed unit. Entire output of new unit flows through 15-kv bus to 150-Mva, 15-132-kv, 3-phase transformer, thence to 2 OCB's in outdoor switching station.

Generator for 4,500-Psi . . .

Philo Unit Fits Space Limitations

- **Conductor cooling used to cut length and gain experience for future units**
- **Building extension houses shaft-driven geared exciter**

F. M. PORTER, Electrical Engineer, American Gas & Electric Service Corp, New York, N. Y.

Starting up a 4,500-psi super-critical pressure boiler and steam turbine generator of 125,000-kw capacity this summer at Ohio Power Co's Philo Plant is a pioneering effort ("First Commercial Supercritical Pressure Steam-Electric Generating Unit for Philo Plant," S. N. Fiala, ASME Nov. 1955). The generator and excitation of this unit offer opportunities to apply additional ideas advancing the art and yielding substantial economies.

To capitalize on the full potential of these opportunities, General Electric Co cooperated with American Gas & Electric Service Corp by building a special 125,000-kw generator for the Philo installation. This machine has internal-conductor hydrogen cooling although conventional hydrogen cooling would have served. The new unit brings conductor cooling to the system which first applied hydrogen cooling to a condenser in 1928 and to an alternator in 1937 ("Application of and Operating Experience with Hydrogen-Cooled Synchronous Condensers and Alternators," Philip Sporn, F. M. Porter, Trans. AIEE Vol. 59, p 890).

This article reviews design innovations of the Philo machine, explains reasons that underlie them, and states what gains are anticipated from them in installation and operation.

Basic Considerations

The new unit is only slightly larger than the old 40,000-kw air-cooled unit that it replaces. This is in spite of the fact that the high-pressure turbine will be twice as long as the old turbine. The existing turbine-room crane can handle the new generator rotor, and an auxiliary crane in a small building extension built to accomodate the shaft-driven exciter will handle the exciter and assist in removing the generator rotor. The conductor-cooled generator is 4 ft shorter than a conventional hydrogen-cooled machine of the same rating.

An 8-kv multi-circuit generator was considered for reducing length, but this would have required relatively expensive bus duct to carry over 11,000 amp. But conductor cooling of stator and rotor achieved the desired shortening. Gas cooling was chosen because the manufacturer felt that the machine was smaller than would be suitable for liquid cooling. The designers selected 15 kv as preferable for the conductor-cooled rotor.

All 82 turbo-generators installed on the AG&E system since 1917 have shaft-driven exciters ("Operating Experience with Shaft-Driven Exciters in Air and Hydrogen," F. M. Porter and H. B. Margolis, Trans. AIEE Vol. 71, p. 758). All 1,800-rpm machines and the smaller 3,600-rpm units have direct connected exciters. Larger 3,600-rpm machines use gear-driven exciters, long experience having demonstrated the reliability of such exciters and gear mechanisms. Although a motor-driven exciter was considered and would have been accepted for the Philo unit if absolutely necessary, AG&E was able to exercise its preference for the shaft-driven geared type.

Capacity in Hydrogen and Air

Nameplate rating of this generator is 125,000 kw, 0.8 pf, 156,250 kva, 3,600 rpm, 15 kv, conductor-cooled with hydrogen at 30 psi. It has 0.8-pf capacity at 15 psi of 93,750 kw; at 0.5 psi, 50,000 kw; and in air 25,000 kw. At the time it was purchased, it was thought desirable to be able to run in air at no load for balancing not only during initial startup but later in case rebalancing should ever become necessary over a period of years.

This air capacity might well be eliminated for future machines in the interest of improved efficiency and a design more suited to operation at gas pressures of 45 psi and higher. AG&E would have accepted an air-cooled capability sufficient only for no-load operation at normal voltage. But it was feasible to obtain 20% capacity because of very low copper losses. The other capacities in hydrogen up to 30 psi naturally followed.

Exciter Is Shaft-Driven

Excitation requirements for a 100,000-kva, 0.8-pf, conventional hydrogen-cooled generator at 30 psi would be approximately 250 kw, or 1,000 amp at 250 v. A machine of the same physical size but designed for conductor cooling could easily be rated 150,000 kva. At that rating it would require about 1,500 amp at 375 v, or 563.5 kw. Were a 250-v exciter used instead, 2,250 amp would be required. This is very close to the excitation requirement of the Philo 156,250-kva, 0.8-pf machine.

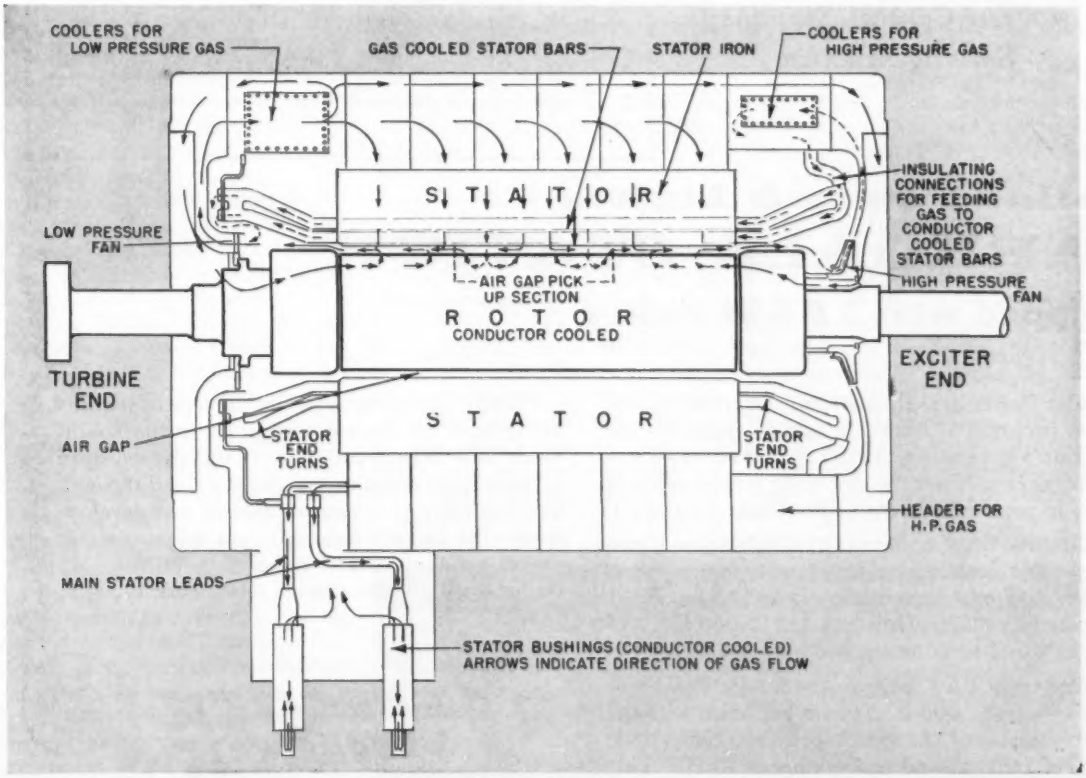
Excitation for this unit is provided by a shaft-driven, gear-connected exciter rated 600 kw, 250 v, 890 rpm. Originally there was some question whether a satisfactory shaft-driven arrangement could be provided on an exciter of this size. But the designers were able to develop a 6-pole instead of an 8-pole machine. They obtained space below the commutator for maintenance purposes by increasing the size of the driving pinion and associated gear, thus raising the centerline of the exciter well above floor level. This provided accessibility to brushholders and brushes. Accessibility was further improved by reversing brushholders in the lower arms.

The exciter was rated 250 v instead of 375 v for two reasons: The proportions of the field conductors for the conductor-cooled rotor design worked out more favorably; and spare motor-driven exciters rated 250 v are available at Philo which could be used to furnish partial excitation in emergency or to transfer excitation for maintenance on the exciter, commutator, and brushes. A static-type voltage regulator with Amplidyne control is being used because its performance has been demonstrated by many years of operation on 19 AG&E generators.

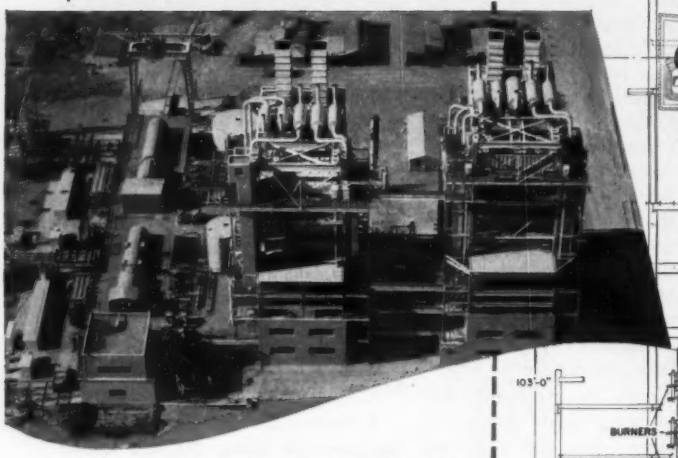
Ventilation for exciter and collector rings is conventional. Air is drawn from basement through filters in the lower portion of the exciter-collector-ring housing and discharged at each side of the housing base.

Stator Has Cooling Ducts

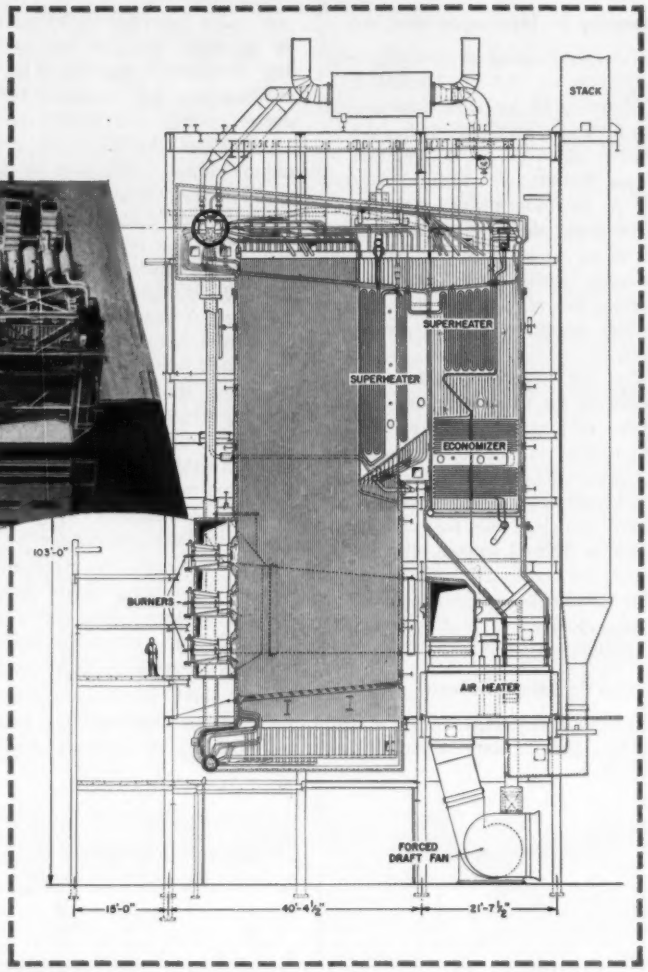
A single-circuit winding is used for the generator stator, the coil section being in two parts with ventilating ducts between. On either side of the ducts there is the usual Roebel transformation for the two groups of strands. The six rectangular stainless-



CROSS SECTION shows direction of hydrogen flow in stator ducts, rotor bars, and air gap of conductor-cooled generator



Air View of Parkdale Station of Dallas Power & Light Company. Consulting Engineers: Ebasco Services, Inc.



Modern Central Stations Serving America

Dallas Power & Light's PARKDALE STATION

Equipped with 3 B&W Boilers

Dallas Power & Light Company's current expansion program at Parkdale Station increases the Station's generating capability to 327,000 kw—to serve even better the mounting power needs of this important segment of the Great Southwest.

Of three B&W boilers at Parkdale Station, two are on the line and the third is under construction, scheduled to begin operation in 1957. Unit No. 1 serves 87,000 kw, Unit No. 2, 115,000 kw, and Unit No. 3, 125,000 kw.

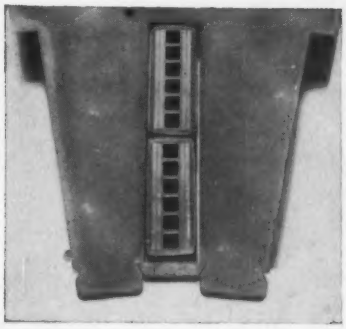
The latest B&W unit chosen for Parkdale will provide 1,050,000 lb of steam per hour, with design pressure of 1725 psi, superheater outlet pressure of 1550 psi and temperature of 1005 F. This B&W Radiant Boiler has a pressurized furnace.

Parkdale is characteristic of the type of stations being built by electric companies in the Southwest; B&W is happy to share in this construction by providing technical advances gained through its continuing program of research and development—for increasingly efficient steam-electric power generation. The Babcock & Wilcox Co., Boiler Div., 161 East 42nd St., New York 17, N.Y.

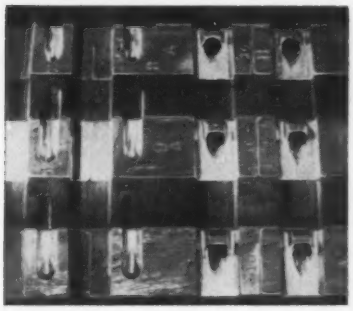
G-764

BABCOCK & WILCOX

BOILER DIVISION



COOLING TUBES resemble black squares in above stator coil mockup. Rotor surface shown below moves upward. Scoops (left) take gas from air gap, ports (right) discharge it



steel ducts carry cooling gas. Insulation between the ducts and between them and the copper conductors minimizes eddy current effects. The stainless-steel ducts carry none of the machine's generated current.

The main insulation system for the coils is new. Coils are preformed by a heat-molding process giving a mica-based insulation far superior to the old bituminous-resin-mica-flake material in dielectric strength, thermal endurance, thermal resistivity, and tensile strength. This insulation has been used on several machines since first actual service in Jan. 1954. It's improved properties and favorable experience on other machines prompted decision to use it on the Philo machine.

The gas cooling system for the stator comprises radial passages between packages of laminations. Cooling gas will flow inward through these radial ventilation spaces to the air gap. A high-pressure centrifugal fan, shrunk on the rotor and with special coolers, will be used to cool the stator winding. As the fan has a larger diameter than the rotor, it is on the exciter end of the unit; end connections and stator bushings are at the other end. The fan will blow gas from one end of the generator through the ducts and out the other end.

Connecting the ends of the stator cooling ducts to the cooling tubes presents a problem in providing adequate insulation and creepage distance for inner connecting parts. A metallic header encircles the exciter end of the generator. Connections between it and the ends of the stator cooling tubes are made with molded insulating tubes. Tests have demonstrated that this material is adequate and will not deteriorate because of the action of hydrogen and moisture. A cap is provided for the gas entrance ends of each stator coil. It is made of molded polyester with glass fiber reinforcing.

Gas Flows Through Rotor Bars

Gas for cooling the stator core and rotor winding will come from a low-pressure fan and coolers at the turbine end. This gas will flow through a winding of hollow copper conductors to discharge into the air gap at the end portions of the rotor. Apertures in the middle portion of the rotor will scoop gas from the air gap at several zones and discharge it into the air gap at others. This design provides more uniform cooling throughout the length of the rotor winding ("Direct Cooling of Turbine Generator Field Windings," C. H. Holley and H. D. Taylor, Trans. AIEE Vol. 73 Pt. III, p 542). Warmed gas from the rotor and the stator care will flow axially outward from the center of the machine along the air gap to the blowers.

Bushings Conductor Cooled

Full-load current at normal voltage on the stator will be 6,015 amp. It is planned to use 25-kv bushings similar to a normally rated 4,000-amp type but arranged for conductor cooling of the bushings. Gas will be circulated through a tube to the bottom of the bushing's interior and will return past the conducting tube of the bushing, thereby removing heat very efficiently. Tests indicate that temperature rise is very little.

Can Boost Hydrogen to 45 Psi

An important advantage of conductor cooling is that additional output can be obtained by going to gas pressure above 30 psi. An additional 10% capacity is available in the Philo machine at 45 psi hydrogen. Tests will be made at the factory to 60 psi and perhaps higher. Tests at Philo will extend to 45 psi.

The seal oil system will permit commercial operation at gas pressures up to 45 psi. To maintain minimum humidity, it is desirable to vacuum treat the oil. AG&E's experience on many generators for 18 years has demonstrated that seal oil removes moisture from gas in the generator just as vacuum treatment removes it from the seal oil. Extremely low absolute humidity is thus maintained.

Generator Characteristics

Sub-transient reactance of a standard 156,250-kva (30 psi rating), 3,600-rpm machine would be 11 to 14%. The Philo machine will have a sub-transient reactance of about 18%, based on 156,250 kva. The transient reactance will be 26%, the synchronous reactance 230%, and the short-circuit ratio 0.5.

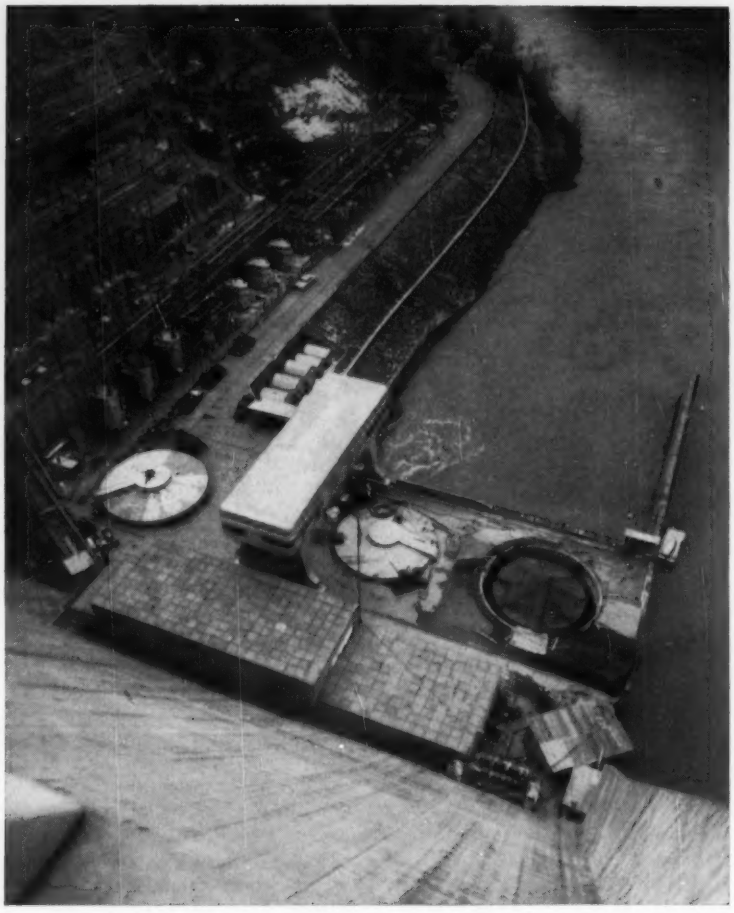
Expected generator efficiency is about 98.5%. This compares with 98.6% for a conventional machine of the same rating. It is possible that final tests will show losses essentially the same for either design.

Operation of this 125,000-kw unit will provide much information of value in designing the much larger machines which will be used very soon. Particularly it offers a quick test of conductor cooling for both stator and rotor, including the air-gap pickup design of rotor cooling. It also extends experience with the new insulation for stator coils. And it will add useful information to long experience with gear-driven exciters.

Philo Unit Weighs Less Than Conventional Design

	Approximate Weight, lb	
	Philo No. 6	Conventional
Generator rotor	64,000	80,000
Generator stator, including shields, coolers, etc.	373,600	456,000
Exciter and gear	31,200	23,500
Total generator and exciter	469,200	559,500

This 330-in. diameter rotor is being installed at . . .



TVA's Hiwassee Dam, as the world's largest . . .

Reversible Pump-Turbine Readies for Action

Turbine acceptance tests were completed recently for the world's largest reversible pump-turbine, designed and built by Allis-Chalmers Mfg Co for TVA's Hiwassee Dam. The unit is now undergoing pump tests.

TVA engineers report, however, that "final efficiency acceptance tests" cannot be held until the head is at or near the rated head of 205 ft. The present head between Hiwassee Lake and Apalachia Lake is about 230 ft. The engineers estimate that under normal conditions the necessary drop to 205 ft will occur about November at the earliest.

A-C reports that the unit is not only the world's largest, but the first installation in the western hemisphere of a reversible pump-turbine for the initial purpose of helping to level system load curves.

Its 266-in. Francis-type runner was built and shipped in three sections and bolted together at the job site.

The 330-in. diam rotor weighs 305 tons. In installing the rotor, an equalizing bar with pointer kept the rotor level to assure equal distribution of its weight on the two points of the gantry.

The view of Hiwassee Dam shows the pump-turbine partially assembled at right while its weather top is at extreme left. The other unit is a hydraulic turbine-generator.

Electrically, the dual-purpose machine is rated 70,000 kva as a hydraulic turbine-generator and 102,000 hp as a pump-driving motor. Hydraulically, it is designed to generate 80,000 hp under 190-ft head and to pump 3,900 cfs against 205-ft head. Rotation is clockwise for generating, counter-clockwise for pumping.

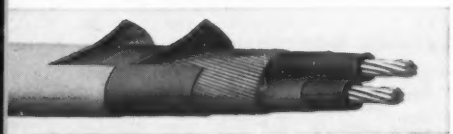
Variations between the unit's electrical characteristics and those of a typical hydraulic turbine-generator are due chiefly to its dual purpose as generator and motor. Ratings as a motor are 102,000 hp, 95% pf, 80C rise, 13.5 kv, and 135.9 rpm; as a generator, 59,500/68,425 kw, 70,000/80,500 kva, 60/80C rise, 85% pf, and 105.9 rpm.

Engineering studies of this unit appeared in Electrical World, May 11, 1953, page 36 and July 5, 1954, page 16.

(*More M & M on page 55*)

MORE POWER to run the appliances homeowners want—and more kwhr sales—are assured by Silvaline Type SE Service Entrance Cables.

The cable that helps to break a bottleneck



Silvaline is the only Type SE Cable with URC saturant and finish.

IF YOU are encouraging or promoting adequate residential wiring in your area, you'll want to investigate Anaconda's new Silvaline* Type SE Service Entrance Cables for pole to meter installations.

Silvaline Cables with 100-Amp rating, or more, offer equal or greater capacity than called for by the new Voluntary Adequate Wiring Code of the National Association of Home Builders—break the bottleneck to higher kwhr sales. In addition . . .

Long life under severe conditions. Silvaline is the only service entrance cable with URC† saturant and finish. Resists festooning . . . assures long life.

Fewer complaints. Silver finish on Silvaline takes any type or color of house paint . . . won't bleed through, flake or peel. Ends customer complaints.

Ask the Man from Anaconda for more information or write for folder on Silvaline Type SE Service Cables. Address: Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.

*Reg. U.S. Pat. Off.
†Utilities Research Commission

56959

SILVALINE TYPE SE CABLES — 100-AMP RATING OR MORE

Conductors	Insulation	Rating (in amps)
3/C #3 with #3 or #5 neutral	Type RH	100
3/C #2 with #2 or #4 neutral	Type RH	115
3/C #1 with #1 or #2 neutral	Type RH	130
3/C #0 with #0 or #1 neutral	Type RH	150

ASK THE MAN FROM ANACONDA®
FOR SILVALINE TYPE SE-100 SERVICE ENTRANCE CABLE

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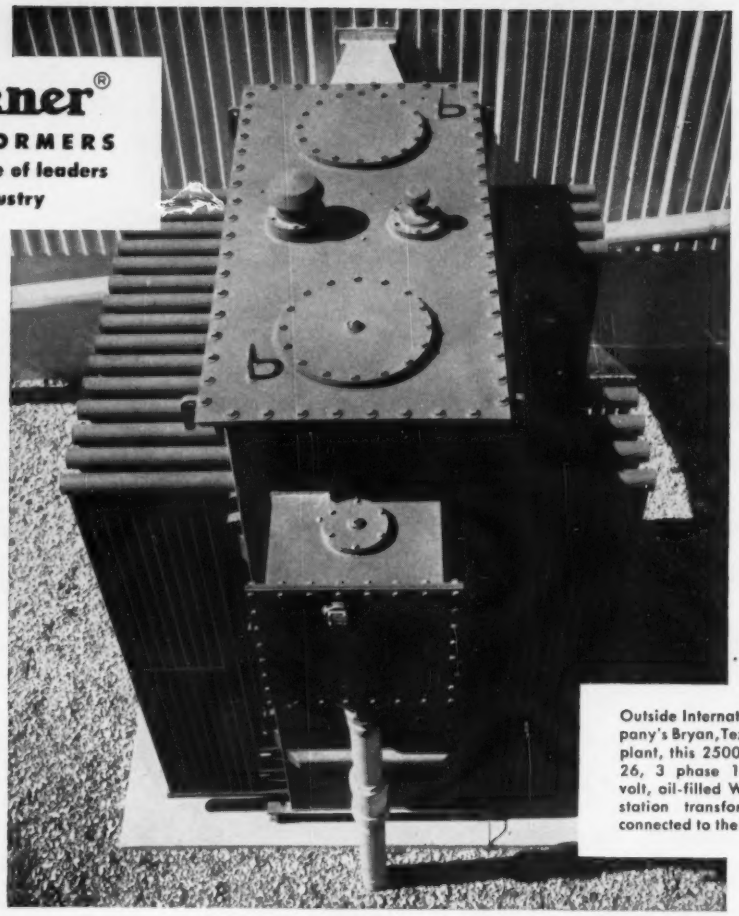
... the choice of leaders in industry



Outside International Shoe Company's Bryan, Texas rubber soling plant, this 2500 kva, type HPA-26, 3 phase 12,500 to 2400 volt, oil-filled Wagner unit substation transformer is throat-connected to the load-center.

WAGNER UNIT SUBSTATION TRANSFORMERS

... liberally designed to give years and years of service ...

The importance of the transformers in your plant power distribution system cannot be over-emphasized. If a switch or a circuit breaker fails, only a part of the system is affected—but if the transformer fails, the entire system is dead. Think of the cost to your plant in terms of cancelled orders and lost manhours in the event your present system broke down.

International Shoe Company, world's largest shoe manufacturer, has made sure the distribution system in their Bryan, Texas rubber soling plant has a power supply adequate to meet all their power needs. They want ample, maintenance-free, reliable service for a long time to come. That's why International chose a Wagner unit substation transformer for this plant.

Why not discuss your next transformer installation with the Wagner engineer nearest you? There are Wagner branches in 32 principal cities. Bulletin TU-181 gives full information on Wagner Power Transformers and Bulletin TU-205 tells about Wagner Unit Substation Transformers. Write today for your copies.

Wagner Electric Corporation
6456 Plymouth Ave., St. Louis 14, Mo., U.S.A.

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WT56-2

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES • AUTOMOTIVE BRAKE SYSTEMS-AIR AND HYDRAULIC

Can Heat Pumps Do Job Alone?

By using multi-stage compression they can heat efficiently from air in the —22F range—without supplementary heat—says specialist

A heat pump that will work efficiently at low temperatures without the need for supplementary heating—this is the claim by Refrigeration Expert Robert G. Werden, York Corp.

Werden has come up with a development he says will permit utilities in northern climes to promote air-to-air heat pumps without fear of excessive peak demands on cold days.

His idea for eliminating supplemental heat hinges on the heat pump's compressors rather than on heat storage, the direction most heat pump research is taking today.

Werden would use a multi-stage or compound compression system—a method long used in ice cream plants and other refrigeration applications—in place of single-stage systems found in most present-day air-source heat pumps. To explain it he first goes back to some refrigerating fundamentals:

Lower Coil Temperatures

"Air source heat pumps depend on removing heat from outside air by passing it over a refrigerant evaporator coil whose temperature is well below the outside air temperature. To secure enough heat, outdoor air must be cooled. The lower the coil temperature the more heat is removed from the same amount of outside air. So, if 100,000 cfm is to be cooled from 0 to —10F, a coil surface temperature lower than —10F is obviously necessary, resulting in a refrigerant evaporator temperature of say —20F.

Single-stage compression as used in present heat pumps is all right for summer cooling, concedes Werden, because the compression ratio is low. For instance, in the cooling cycle it would compress from a pressure equivalent to 40F up to a pressure equivalent to 110F (51.68 psia to 150.7 psia), a compression ratio of only 2.92. But in winter compressing with single stage from a pressure equivalent to say —20F up to a pressure equivalent to 110F (15.28 psia to 150.7 psia), means a compression ratio of almost 10 to 1. These high ratios prevent the single-stage heat pump compressors from developing enough winter heat, Werden continues. Thus they require extra compressors and/or supplementary heat—a crutch which has been costly to the user and objectionable to the utility.

"Compressor performance is to a large degree dependent on its volumetric efficiency," Werden goes on. "Lower compression ratios yield higher outputs. Multi-stage compression reduces these compression ratios and thus increases output."

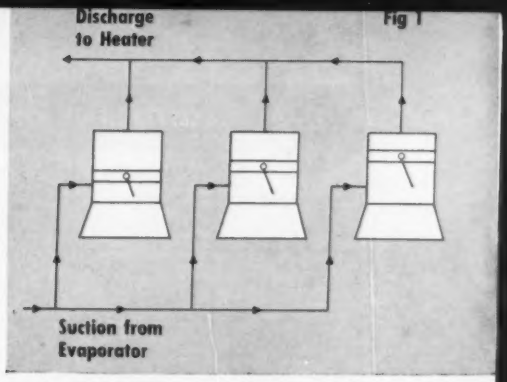
Fig 1 shows the arrangement of compressors in a heat pump using single-stage compression. Fig 2 shows the same compressors as in Fig 1 but re-arranged for operation with compound compression.

Changing from one to another is simply a matter of switching the automatic valves in the piping system, says Werden. "You go to multi-stage compression whenever outdoor temperatures are low enough that it would yield a higher coefficient of performance than single-stage compression."

In Fig 3 Werden compares the performance of the two-stage compression system (liquid subcooling) with a single-stage system without subcooling. The solid lines show relative heat output; the broken lines, electrical input based on 90% motor efficiency. At —20F evaporator temperature he shows Scheme A (two-stage) to produce 67½% more heat than Scheme B (single-stage). Likewise, Scheme A, at —20F, is shown to produce 1,000 Btu's per hr at 110F condensing temperature for 100 w (compressor only) whereas B would require 167 w.

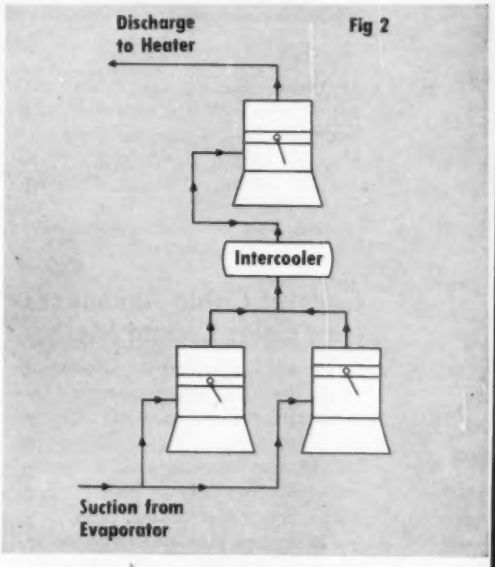
Further, if Scheme B were to be supplemented with resistance heating

Fig 1



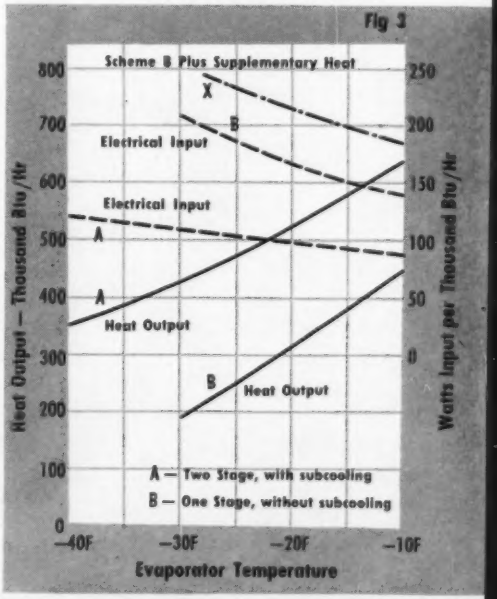
Instead of single-stage system . . .

Fig 2



multi-stage compressors would . . .

Fig 3



. . . draw more heat, use less watts

COEFFICIENT OF PERFORMANCE*				
EVAPORATOR TEMPERATURE	1 STAGE WITHOUT SUBCOOLING	1 STAGE WITH SUBCOOLING	2 STAGE WITH INTERCOOLING	2 STAGE WITH SUBCOOLING
–40°	–	–	2.16	2.69
–30°	1.55	1.77	2.34	2.96
–20°	1.95	2.30	2.60	3.25
–10°	2.27	2.73	2.81	3.56
*(COMPRESSORS ONLY)				

to produce the equivalent heat output of Scheme A, the total watt input would be still higher, according to Werden. This is shown in Curve X.

Table shows the relative coefficient of performance for various evaporator temperatures, using the various types of single and two-stage systems.

York, which has applied for a patent, says equipment for installations using the multi-stage development is now available for commercial and industrial applications. It hopes to have a smaller packaged unit ready for the residential market sometime in 1957.

No actual operating test data have been developed, but one system was put into operation last month in a Roanoke, Va. department store. Served by Appalachian Electric Power Co, it has a capacity of 312 tons summer cooling and 2.4 million Btu per hr winter heating at 0 F. Another system will go into a small office building now under construction in Philadelphia.

Werden plans to present the development in a formal paper in June at the annual meeting of the American Society of Refrigerating Engineers.

General Cable Announces New Color Coding Method

General Cable Corp announced recently that it is now prepared to furnish an improved method of color coding. The method will apply to the individual rubber-insulated, neoprene-jacketed conductors of multiple conductor power and control cables.

The new process consists of the application of brightly colored synthetic rubber base coatings to the surface of the black neoprene-jacketed conductors. The base coatings will be supplemented where necessary by colored stripes.

General Cable says the process will result in improved cable quality. This is accomplished by the use of black neoprene jackets throughout, brighter and more easily recognizable colors, positive conductor identification on immediate inspection, and generally improved cable appearance.

This method of conductor identification is reported to comply with IPCEA Standard S-19-81, Method 1.

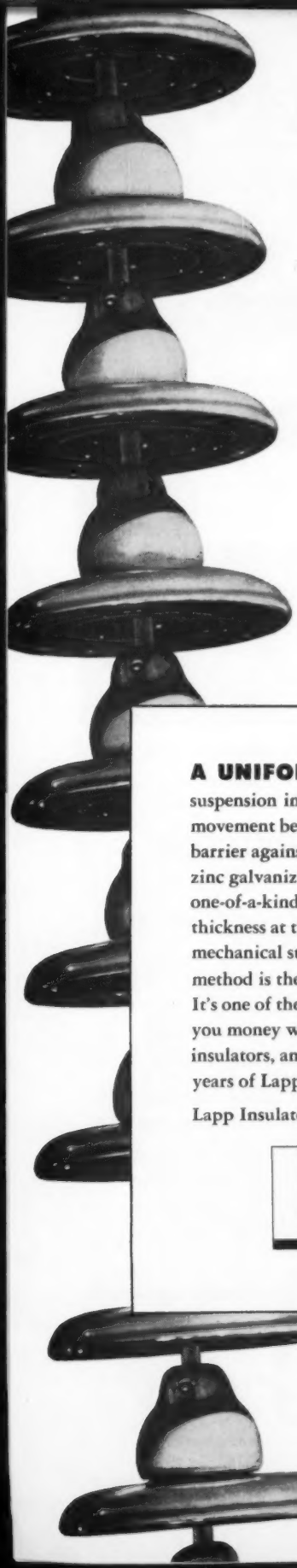
T&B Adopts Color Keying

A new method for installing electrical compression connectors—color keying them to their installing dies—was announced recently by Thomas & Betts Co, Elizabeth, N. J. The system is employed in T&B's most recent line of connectors for copper conductors, including an electric utility line. Each connector size bears the same color marking as the corresponding installing die; the installer just matches the color on connector and die.

L-M Pushes PV Switches—Literally and Figuratively

"Pushing PV Switches" has become a literal, rather than figurative, expression to Line Material Co's field engineers. By means of a "caddy cart" device, they are pushing 150-lb single-phase switches, representative of L-M's PV line, into utility engineers' offices. Utility engineers, therefore, can inspect a switch and operate it conveniently. Shown is L-M engineer H. J. Baerwald pushing a 15-kv, 600-amp switch into a customer's office.

L-M manufactures group-operated, vertical-break PV switches rated 7.5 through 69 kv, up to 120 amp. A 115-kv switch, 600 and 1,200 amp, will be in production this year.

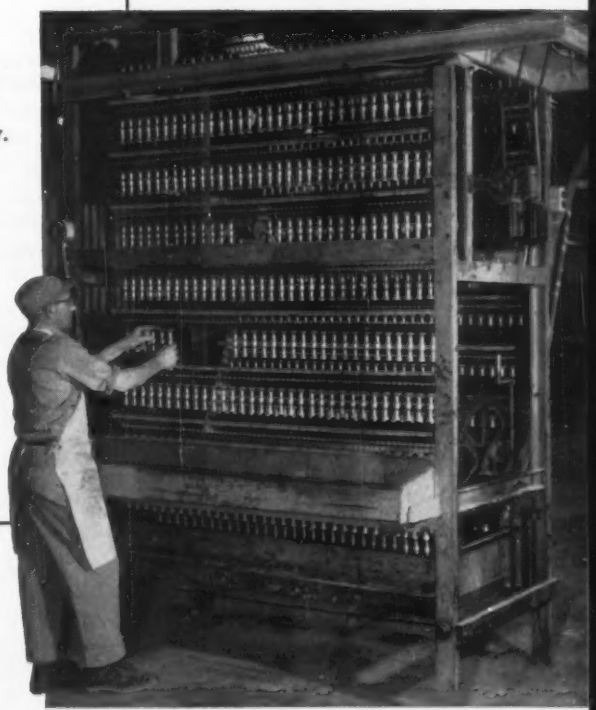


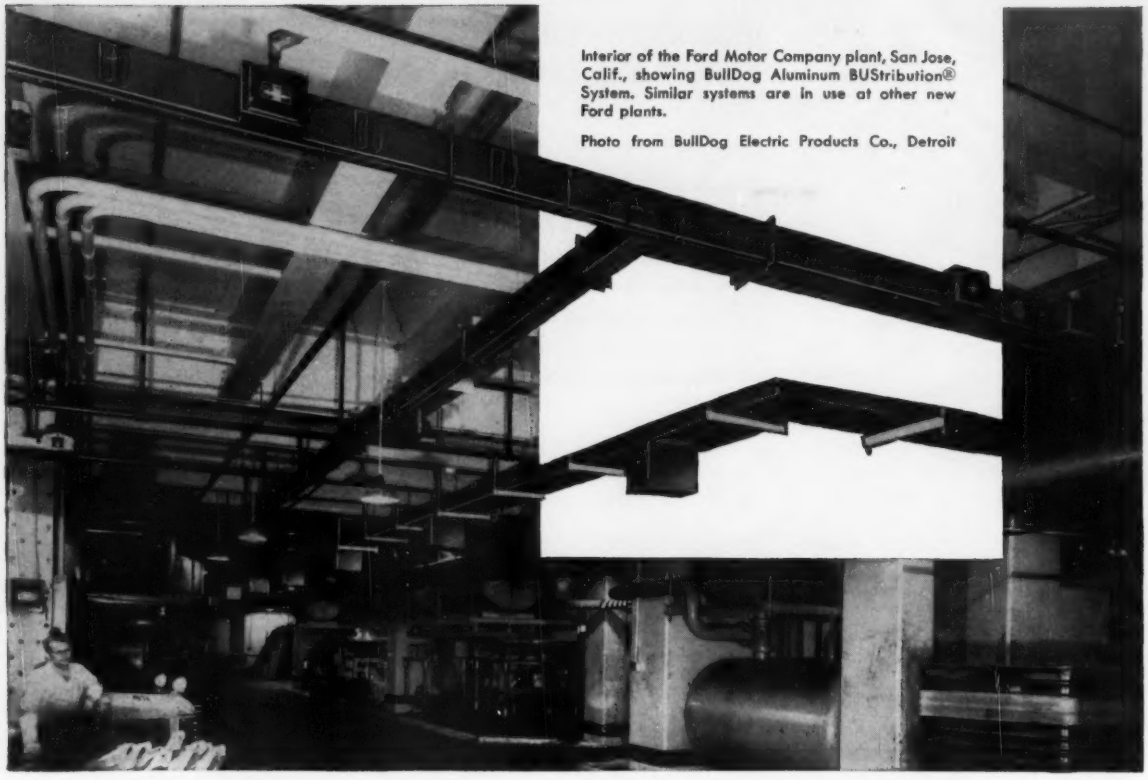
MOST FOR YOUR MONEY in high voltage insulation. Today's Lapp suspension discs are the best insulators of this design we have ever made. Their quality—and their low price—are the result of automation and control in manufacture. Their uniformity is your guarantee of their performance—in mechanical strength, electrical permanence, long life.

A UNIFORM LAYER of resilient paint on the suspension insulator pin provides a cushion for thermal movement between pin and cement porcelain head—and a barrier against chemical action between cement and zinc galvanizing. Lapp designed and built this one-of-a-kind dipping machine because paint thickness at this point is a critical factor in insulator mechanical strength, and because such an automatic method is the only means for assuring its uniformity. It's one of the exclusive Lapp techniques that save you money when you buy Lapp suspension insulators, and continue to pay off over long years of Lapp insulator service.

Lapp Insulator Co., Inc., Le Roy, N. Y.

Lapp





Interior of the Ford Motor Company plant, San Jose, Calif., showing BullDog Aluminum BUStribution® System. Similar systems are in use at other new Ford plants.

Photo from BullDog Electric Products Co., Detroit

FORD INSTALLS BUSWAYS USING 1,500,000 POUNDS OF ALUMINUM CONDUCTOR

Installation costs less, provides more power per pound of metal. System is more flexible and operates with no increase in voltage drop or temperature rise over comparable copper system.

Since 1951, Ford Motor Company has been equipping its new plants with aluminum bus distribution systems. These include plants at Detroit, Chicago, Buffalo, Cleveland, Louisville and San Jose.

By switching to aluminum, Ford diverted more than 3 million pounds of critical copper to other uses. And Ford acquired a distribution system at lower cost.

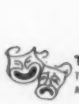
Because aluminum is lighter, Ford received more conductor per pound of metal . . . put less weight on the building superstructure.

Because aluminum costs less than copper, Ford received more conductor per dollar invested.

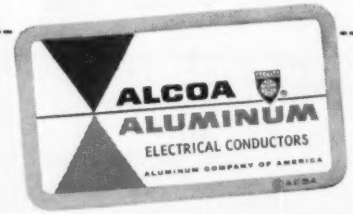
And these prefabricated conductors make a neat, safe, flexible installation that brings power to the job in any amount at any location. They can be readily moved to meet new power demands. Standard fittings, tools and methods are employed.

For more information on these modern packaged plant distribution systems, contact your nearby Alcoa sales office. Or write Aluminum Company of America, 2306-E Alcoa Bldg., Pittsburgh 19, Pa.

Your Guide to the Best in Aluminum Value



THE ALCOA HOUR
TELEVISION'S FINEST LIVE DRAMA
ALTERNATE SUNDAY EVENINGS



Personal Calls + Premium Coupons = Sales

Montana Power found formula worked on farmer. Now it's trying the same techniques on urban customers in year-long "Live Better . . . Electrically" drive

Montana Power Co is not one to look a front-running horse in the mouth. So, like two successful rural appliance promotions sponsored in 1953 and 1954-55 (EW, Oct. 31, 1955, p 56), the company's money will again ride on purchase allowances in its year-long "Live Better . . . Electrically" race for added load.

The program started Jan. 1 and runs to Dec. 31. It is aimed at 35,800 urban residential customers in Montana Power's Billings and Great Falls divisions. The cash allowances, in coupon form, are offered to customers who buy one or more of four appliances or an electric water system.

The LBE promotion has several new features over the rural campaigns. Electric air conditioners qualify customers for a coupon. An obsolete range or water heater entitles the customer to a cash allowance when he buys a replacement unit. And the company has a time-pay wiring plan to encourage use of new or higher-capacity wiring.

House-to-House Selling

As in the rural campaign, Montana Power representatives are touring their districts on house-to-house calls which will blanket all customers by mid-year. They explain the program, sell advantages of appliances, present the time-pay wiring plan, and leave a coupon for each of the promotion appliances which the customer lacks.

Coupons are worth these amounts to the customer: $25 for ranges and water heaters; $10 for freezers, dryers, electric water systems, and refrigeration-type air conditioners, ½ hp and over. The coupons go to the dealer as part payment when a unit is bought, then the company redeems them.

Customers with ranges or water heaters having no resale value can get in on the utility's roundup feature. To qualify for a $25 allowance, the customer first puts the new appliance in use, then the old unit must be junked.

The Goal: 6,251 Appliances

The program's total appliance quotas for both divisions is 6,251 units including 2,292 ranges; 600 water heaters; 1,880 dryers; 994 freezers; and 485 air conditioners. Total dollar value of this equipment is $1,737,755. Company representatives in each division are contacting distributors and dealers to explain the campaign and urge tie-in cooperation including advertising, direct mail, and customer follow-up.

The time-pay plan for rewiring is available to all residential and rural customers in Montana Power's service area. Through the program, either the company or an electrical contractor may draw up wiring specifications for customers. To qualify, each job must meet standards in the Residential Wiring Handbook. The customer designates a contractor to whom the layout will be submitted for bid.

Upon satisfactory completion of the job, the company pays the contractor and bills the customer monthly. These monthly charges are turned over to banks holding customers' notes. Plan provides loans up to $500 to be paid over a 36-month period.

Gas Competition Looms Tougher in Northwest

Natural gas will cost Portland Gas & Coke Co customers less than the oil-gas it now manufactures if new rates for which the company plans to file win approval. The firm, largest Pacific Northwest gas utility, proposes lower residential and commercial rates for natural gas coming from Colorado in August.

The planned rate change would be a cut of $1.7 million, based on 1955 sales, or an average reduction of 18%.

Electric and oil competitors, currently on top of home fuel business, will study the proposal carefully since PG&C expects the lower charges to attract big additions to its 61,000 customer total. The company serves Oregon's Willamette Valley and nearby Clark County-Vancouver, Wash.

Interruptible monthly industry rates proposed earlier were 3.3¢ per therm for first 100,000. Low rate now is 15.3¢ a therm for manufactured gas.

Gets Certified Lighting

Electrical Association of New Orleans, Inc, launched a Certified Lighting Committee recently to build and sell-up commercial, industrial relighting markets and new lighting jobs. Its first project is an eight-week course on designing, selling lighting for contractors and salesmen.

S & S SHORTS

Who Wants a Range?

Thirteen electric ranges are prizes for best 25-word reasons why "I Want an Electric Range" in fourth annual Sacramento Municipal Utility District and Sacramento Valley Electric League promotion. Prizes also will go to best appliance salesmen.

Tarheel Co-ops Set Range Package

Sixteen North Carolina co-ops, tying in with local dealers, offer two-month electric range plan that (1) offers free installation and (2) free electricity for four or more months with 125 kw credit on purchasers' bills.

BUSINESS OUTLOOK

Electrical World
MAY 7, 1956

Business has been as slow as the weather to show the hoped-for Spring pickup. The sideways or slightly declining movement of most economic indicators continues, and no sharp rise is in sight until Fall. It may be timely at this stage to review first quarter performance in relation to 1956 objectives.

• • •

Gross national product has risen at an annual rate of $2 billion in the first quarter, compared to around $5 billion a quarter last year. (What's more, most of the rise this year is simple price increases.) **Industrial production has actually declined:** seasonally adjusted, the index which went from 142 last September to 144 in December is now back to 142. Consumer income after taxes, and personal consumption, rose but little in the first quarter—and hardly at all on a per capita basis. Non-agricultural employment, seasonally adjusted, has stayed almost unchanged at the December level. Hence—with a growing labor force—unemployment has been rising: from about 3½% to 4½% of the labor force. There was no significant change in hourly wages in the first quarter, but a 2% decline in weekly hours. Also, the four year decline in farm incomes has not yet been brought to a halt.

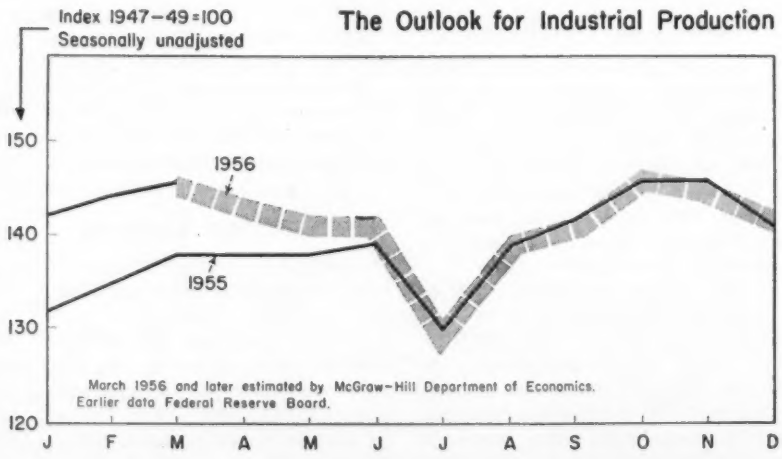
• • •

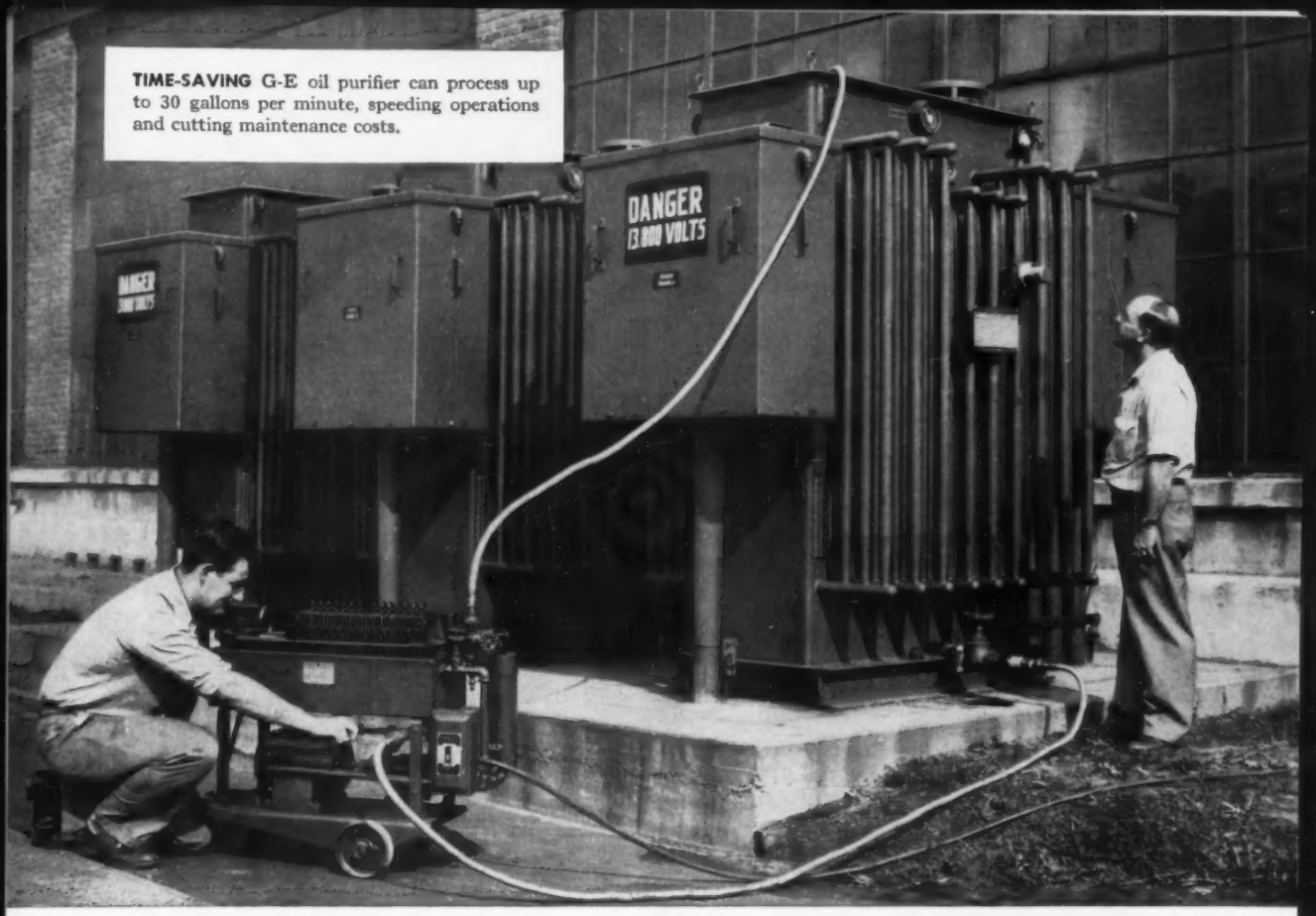
By now weakness has gone beyond the fields of autos and housing into the areas of rubber, farm equipment, and certain kinds of home furnishings and appliances. (TV production, though, has shown its first rise in months.) The two expansive forces buoying up the economy at this point are business capital investment, and inventory accumulation. **You can't count on much further help from inventories, though.** They've recently been rising at a dangerously high annual rate of $7 billion, and the ratio to sales is getting uncomfortably high. The hope for resumed growth in the second half of this year rests on a really vigorous revival of autos and housing—which would bring such associated industries as rubber, and home furnishings along with them. It will take a really big upswing in these to offset the indicated letdown in inventory formation. The signs are still hopeful that we'll get it—especially if the Congress insists on tax cuts.

• • •

One helpful factor is that the Federal Reserve's tight money policy can be reversed as soon as the inventory buildup stops. Another is that consumers have been reducing their debts this year—at an annual rate of $6 billion. If this continues, they should be able to finance another big splurge on cars and appliances in the fall, if so minded.

The Outlook for Industrial Production





TIME-SAVING G-E oil purifier can process up to 30 gallons per minute, speeding operations and cutting maintenance costs.

Cut maintenance costs with G-E Purifiers

Recondition insulating liquids quickly and easily with this low-cost device

You may be able to cut your maintenance costs in filtering insulating liquids for transformers, regulators, and other electrical equipment by using General Electric purifiers for oil and Pyranol*. The purifiers, which filter out suspended sediment and free and dissolved water, have high capacity, do high-quality work, and are easy to use.

It is important, of course, to filter the insulating liquid when filling a tank for the first time, or when refilling an old tank. Maintenance of dielectric strength is more important today than ever before because many users are ordering transformers with reduced basic insulation levels. If periodic testing indicates a need for filtering, the G-E purifier will do the job, safeguarding equipment life and helping to assure continuous service to customers.

High Capacity—The new G-E oil purifier with 7-inch filter-paper plates has a capacity of 12 gallons of liquid per minute, a 20 per cent increase over other available models. This means rapid filtration, short shutdowns, and low maintenance costs. The model for purifying Pyranol has similar output. Models, using 12-inch filter-paper plates, filter 30 gallons per minute.

High-quality Work—Using adequately dried filter paper, you can normally raise the dielectric strength of oil to be reconditioned to 30 kv with just one pass through the purifier.

Easy to Use—Simplicity of operation saves time in training maintenance crews. Unskilled workmen can easily set up and operate G-E purifiers. The single-phase pump motors operate on 115/230 volts, and the filter-paper drying ovens used in conjunction with the equipment are rated for either 115/230 volts or 230/460 volts. Purifiers and ovens can be quickly connected either to single-phase lighting circuits or to one phase of a three-phase circuit.

For More Details—For complete information on low-cost G-E purifiers for oil and Pyranol, drying ovens, and filter paper, contact your nearest G-E Apparatus Sales Office, or write for Bulletin GEA-1333, Section 431-45, General Electric Company, Schenectady, New York.

*Registered trade mark of General Electric Company.

Progress Is Our Most Important Product

GENERAL ELECTRIC

What's Behind the Growth in Southeast?

Output for South Atlantic States last year jumped 13.6% above 1954. Other states boast large growth. W. J. Clapp, Florida Power Corp, gives reasons

Electrical energy production in the South Atlantic States last year showed a gain of 13.6% over 1954 —largest of any region not directly affected by the mounting Atomic Energy Commission load. The East South Central States showed a gain of 37% which was due in large measure to the AEC demands but also reflected other large gains. Both these regions and a small part of the West South Central Region cover the southeastern states.

Because of the influence of the AEC load and the makeup of the power regions, it has been difficult to figure the actual growth taking place in the southeastern states. In an address before the Southeastern Electric Exchange in March, W. J. Clapp, president, Florida Power Corp, gave this background on the phenomenal growth in the area:

During the past five years the 27 companies comprising the Southeastern Electric Exchange have nearly doubled their installed generating capacity—from 8.3 million kw at the end of 1950 to 15 million kw at the end of last year. Since 1940 these companies have had a 155% increase in customers, a 323% increase in revenues, and a 330% increase in kwhr sales.

Companies in the area boasting the largest increases in kwhr sales during the period 1940 to 1955 are:

Central Louisiana Electric Co, 1,640%
Gulf Power Co, 1,618%
Arkansas Power & Light Co, 1,196%
Florida Power Corp, 1,003%

Clapp sees three dominant reasons for this growth. These are the wealth of raw materials available in the South, the growing number of technically trained workers available, and the rapidly expanding consumer market.

He notes that numerous industries have been drawn to the area because of the petroleum and wood available there. In Louisiana the petrochemical industry has completed $40 million of construction in the past two years. This industry will have 5,500 new jobs open in Florida during this year. During the past two years the wood and paper industry has employed an additional 10,000 persons at new plants in the Southeast.

To draw on the skilled workers in the region, electrical equipment manufacturers have opened more than 30 plants in the South in recent years. In Virginia there are nine new electrical equipment plants. In North Carolina, 15. These manufacturers have added over 10,000 employees to their payrolls over the past two years.

And for a still brighter future, Clapp looks to rapidly growing trade with the South and Central American countries. He points out that this trade totalled nearly $2½ billion in 1954, and the South is in a most advantageous position to share in the potential market there.

Taking a phrase from the Southern Co's area development advertising, Clapp is convinced that "The last half of the 20th century belongs to the South."

TECHNICAL NOTES

Tool room location can pay dividends in economical plant maintenance.

Plant space clear to the roof over basement hatchways facilitates hoisting heavy generating station equipment.

Washing insulators with powdered limestone blown by compressed air through an insulating plastic tube removes deposits experienced near cement plants.

Pirelli-type high-voltage cable laid in sand in concrete troughs costs less than pipe-type cable and eliminates the pressure-controlled oil system.

Lowest fuel cost will not necessarily be achieved in a nuclear plant having highest thermal efficiency but will be obtained by a compromise between operating temperature and allowable fuel burnup.

Coal ash in a wet-bottom boiler pulverized-fired is about 50% flyash and 50% slag. A dry-bottom boiler converts 80% to flyash, and cyclone-type firing yields 90% slag.

Flat configuration in a 132-kv 3-phase submarine cable minimizes problems of oil expansion when conductors carry heavy current. Flat sides of the sheath compensate for pressure changes.

Pennsylvania PUC Orders Rate Cut

In an order dated March 12 the Pennsylvania Public Utilities Commission ordered the Metropolitan Edison Co to reduce rates by $972,000 annually.

In its original filing, the company had proposed certain adjustments to its various rates which would result in a net decrease of $71,160 in the annual electric operating revenues.

The order noted that such changes would result in an ". . . increase of $300,195 (2.12%) for domestic service customers; an increase of $5,461 (3.55%) for power service customers; a decrease of $251,140 (1.47%) for general power and light service customers; a decrease of $123,794 (2.86%) for large primary power service customers; and a decrease of $1,888 (0.44%) for municipal service customers . . ."

With respect to the fair value findings of rate base there were no substantial differences between the measures of value of the company and those of the commission.

Fair Value Rate Found

The PUC found the fair value rate base of the company to be $165-million as of 12/31/54, or some 17.5% greater than the adjusted original cost rate base. It is of interest to note in this connection that the PUC's method of computing reserve requirements resulted in the adjusted original cost rate base being 4.2% greater than "book" rate base of some $135 million.

On this lower rate base, and one which would be used in many jurisdictions, the fair value is 22.5% greater than the net original cost.

As to the fair rate of return, the PUC granted the company 5.5% on the fair value of its property. Of this amount, 5.26% was the cost of capital. It is of interest to note that the company introduced evidence on current cost of common stock capital, not only with respect to its present capitalization but also on two objective and more conservative capital structures.

The company based its costs on the earnings to book equity ratio which it said should be 11% when applied to its present capital structure. It is here that there appears to be the principal element of disagreement between the company and the PUC. The order says in part "Although the claimed cost of 11% is stated to give important weight to evidence of typical earnings-equity ratios experienced by selected comparable electric utilities and by others (Tr. 519), the claimed 11% is a hybrid, and bears no observable relation to the factual evidence of earnings-equity ratios or to the evidence of earnings-market-price ratios. The use of such a hybrid avoids following the principles and evidence of either ratio to a logical conclusion."

Equity Capital Considered

"At the risk of over simplification," the order continued, "we state that respondent's witness contends that the cost of equity capital finding in these proceedings should be based primarily, if not entirely, upon the earnings-equity ratio, not upon the lower actual or representative earnings-market price ratios which this commission has consistently considered in past."

The PUC went on to say "Although the typical electric utility earnings-equity ratio may remain constant, the price investors will pay per dollar of earnings or dividends moves upward or downward as a result of economic factors such as either the flow of investment capital into equities and away from debt or the reverse flow of capital into debt and away from equities. In our opinion, our use of representative current earnings-price ratios in finding a fair rate of return allows the utility a sufficient amount of return to support the equity portion of the fair value at the typical current equity cost rate actually required by investors.

"The (company's) witness believes," the order continued, "that, since the market price of common stock has continued to exceed book value by a progressively wider margin during the past years, the better appraisal is reflected in the ratio of earnings to book equity. He testified that '. . . the relationship of common earnings to common equity capital measures the rate of return actually earned under effective regulations on the invested equity capital' (Tr. 501).

"We agree that the earnings-equity ratio measures the rate of return actually earned on the equity capital originally invested, but such a ratio is no measure of the return required by investors today. Such testimony overlooks the fact that we must determine a current fair return upon fair value today, not upon original dollars invested.

"In many rate cases the amount of return we allowed produced a far higher earnings ratio on common equity investment than the 11% return that respondent claims . . . The contention for our use of earnings-equity ratios fails to distinguish between the effect of an earnings-price ratio applied to the equity portion of an original cost rate base or an invested capital rate base under Federal Power Commission jurisdiction and the same earnings-price ratio applied to a fair value rate base as required by law in Pennsylvania."

Operating Expenses Cited

With respect to operating expenses, it should be noted that the PUC annualized only the revenues and expenses of customers added during the year and did not annualize the revenues and expenses of customers already connected at the beginning of the test period. To this extent the method used in the present case is different from that used in an earlier hearing in which another utility was concerned.

As to the amortization of storm damage, the order stated "No one knows, of course, the storm frequency to be expected in the future but some adjustment of such abnormal expense in the test year is required. Because of the frequency of severe storms in recent years, our adjustment is based upon an amortization period of only three years instead of five or more years which had been considered reasonable for such items in the past. This results in the extraordinary expenses being reduced to one-third of $137,951, or $45,983, a reduction of $91,968."

A New Service

This new feature will appear on this page every two weeks.

Present May schedule shows that investors will be asked to purchase $451.0 million in debt and only $24 million in equities.

June offerings schedule around $100 million for debt and $33 million for equities, but shifts might occur. Of course, there are several issues that have no date in June. Another factor is the large number of issues scheduled for the second quarter. These can be scheduled anytime.

U. S. Government issue in July.

Another U. S. Government issue is scheduled for August.

U. S. Government issue in September.

Due Deligence Meetings: May 9, Northern Illinois Gas Co; May 11, Pennsylvania Electric Co; May 28, Indianapolis Power & Light Co; June 1, Delaware Power & Light Co; July 9, Florida Power Corp; July 13, Union Electric Co; and July 18, Consolidated Natural Gas Co.

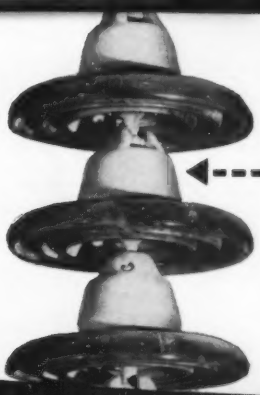
Future Financing

(Furnished by the Irving Trust Co from the "Financing Calendar")

DATE	COMPANY	Amount of Offering (millions) DEBT	EQUITY
MAY			
8	Niagara Mohawk Power	$30.0-C	.....
8	California Oregon Power	16.0-C	.....
9	National Fuel Gas	.....	9.0- -rt Com
15	Pennsylvania Electric	12.5-C	9.0-C Pfd
16	General Electric	300.0-C	.....
17	Northern Illinois Gas	15.0-C	.....
22	Consolidated Edison of N. Y.	30.0-C	.....
23	Southern California Gas	40.0-C	.....
23	Iowa Power & Light	7.5-C	5.6-C-rt
No Date	Jacksonville Expressway	64.0	.....
	Transcontinental Gas Pipe Line	40.0-P	.....
	General Acceptance	25.0-N	.....
JUNE			
1	Central Louisiana Electric	5.0-P	.....
5	Commonwealth Edison	30/50.0-C	.....
6	Braniff Airways	.....	15.0-N-rt Com
7	Indianapolis Power & Light	10.0-C	.....
13	California Veterans	50.0	.....
25	Boston Edison	.....	18.0-C-Pfd
No Date	Delaware Power & Light	.....	8.0-C-rt Com
	Connecticut Power	.....	5.2- -Pfd
	Connecticut Power	.....	2.7- -rt Com
	American Telephone & Telegraph	250.0-C	.....
	Public Service of New Hampshire	8.0-C	.....
2nd Quarter of 1956 (Month not indicated)			
	Detroit Edison	60.0-C-cv-rt	.....
	St. Regis Paper	.....	23.2- -rt Com
	City of Memphis—Power Plant	135.0-N	.....
	Kaiser Aluminum & Chemical	120.0-P	.....
	South Carolina Electric & Gas	.....	5.0-p-Pfd
	Dade County, Florida	34.5-C	.....
	Central Vermont Public Service	1.8-N	0.7-N Com
	Northern Indiana Public Service	12.0	.....
	Kansas Nebraska Natural Gas	6.0-P	.....
	Florida Turnpike	185.0-N	.....
	Jersey Central Power & Light	9.0-C	.....
	City of Dallas	40.7	.....
	Ohio Turnpike	550.0-C	.....
	Washington State Toll Bridge	227.0-C	.....
	Oklahoma Turnpike	63.0-C	.....
	Metropolitan Edison	.....	5.0-C-Pfd
	Federal Land Banks	60.0	.....
JULY			
11	Florida Power	20.0-C	.....
17	Union Electric Co	35/40.0-C	.....
25	Consolidated Natural Gas	30.0-C	.....
No Date	U. S. Governments	2/4,000.0-*	.....
	Pacific Power & Light	.....	9.3- -rt Com
AUG.			
15	U. S. Governments	12,500.0-R	.....
SEPT.			
11	Carolina Power & Light	15.0-C	.....
17	U. S. Governments	1/6,200.0-R	.....
25	Virginia Electric & Power	20.0-C	.....
No Date	Southern Counties Gas	15.0-C	.....
	Pennsylvania Tunnel	25.0-C	.....
3rd Quarter of 1956 (Month not indicated)			
	Ohio Power	28.0-C	.....
	California Toll Bridge	34.0-C	.....
	South Carolina Electric & Gas	5.0-P	.....
	Consumers Power	30.0-C	.....
	Northern States Power	20.0-C	.....
	Rochester Gas & Electric	.....	5.0-N Pfd
	Tampa Electric	10.0	.....
	Texas Eastern Transmission	.....	15.0-N-Pfd

Symbols—C—Competitive; N—Negotiated; P—Private; R—Refunding, cv—convertible; rt—Rights; Pfd—Preferred; Com—Common

*Estimated



Unretouched photo of insulator string from area with corrosive atmosphere — used in television interference investigation.

DO INSULATORS CAUSE TV INTERFERENCE?

For better understanding of television interference problems, a series of tests was recently carried out in the Locke High Voltage Laboratories. Tests showed that suspension insulators do *not* cause TV disturbances except under extremely light mechanical loading combined with contaminated conditions.

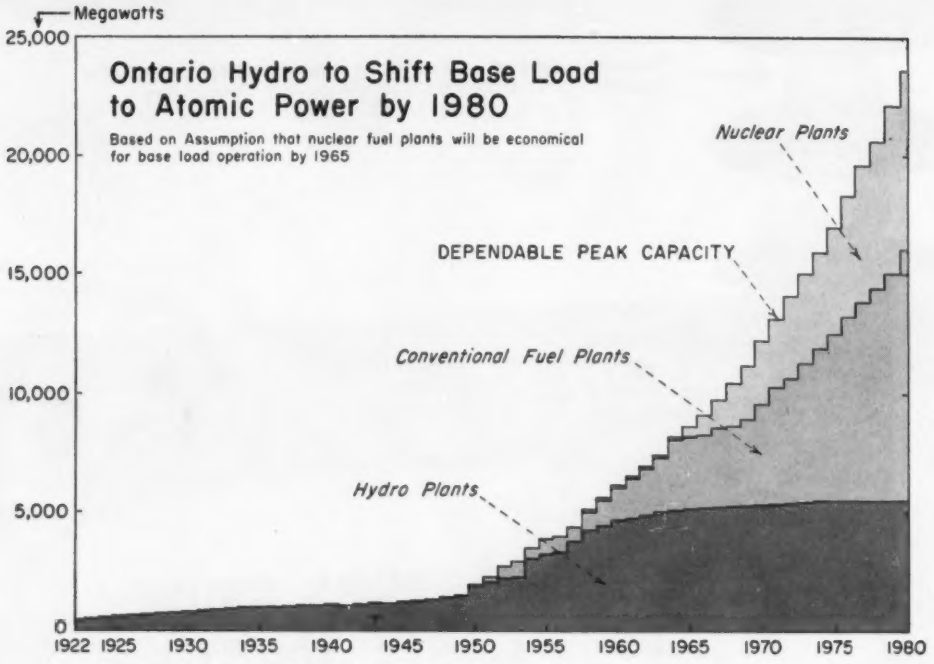
Such investigations are part of our continuing investment in the interest of the Electric Power Industry.

Progress Is Our Most Important Product

LOCKE DEPARTMENT
GENERAL ELECTRIC COMPANY
BALTIMORE, MARYLAND

LOCKE

STATISTICS


Megawatts
25,000
20,000
15,000
10,000
5,000
0
Ontario Hydro to Shift Base Load to Atomic Power by 1980
Based on Assumption that nuclear fuel plants will be economical for base load operation by 1965
Nuclear Plants
DEPENDABLE PEAK CAPACITY
Conventional Fuel Plants
Hydro Plants
1922 1925 1930 1935 1940 1945 1950 1955 1960 1965 1970 1975 1980

Source: Hydro Electric Power Commission of Ontario

Power Statistics . . .

		Latest Month	Preceding Month	Year Ago	Annual Change %
Capacity	Feb.	115.59	114.55	103.74	11.4
Peak—Class I Systems (million kw)	Jan.	95.8	98.2	84.1	13.9
Estimated Dec. '56 Peak (million kw)	Jan.	105.45	105.27	102.56	2.8
Production—billion kwhr	Feb.	47.99	51.12	40.23	19.3
Hydro		10.63	9.36	8.57	24.0
Fuel		37.36	41.76	31.66	18.0
Sales—billion kwhr	Jan.	46.32	45.19	39.47	17.4
Residential		13.41	12.25	11.76	14.0
Commercial		7.00	6.81	6.24	12.2
Industrial		23.57	23.75	19.31	22.1
Other		2.34	2.39	2.15	8.8
Fuel Consumption	Feb.				
Coal—million tons		13.44	15.22	11.09	21.2
Oil—million barrels		7.10	8.22	7.43	−4.4
Gas—billion cu ft		67.81	68.27	63.63	6.6
Net Income Class A & B Co's—$ million	Jan.	127.26	125.72	112.21	13.4
Residential Customers—millions	12 mos. ended	44.51	44.41	43.24	2.9
Revenue per kwhr		2.64¢	2.65¢	2.69¢	−1.9
Avg kwhr per customer	Jan. 31	2,778	2,751	2,564	8.3
Avg annual bill		$73.34	$72.63	$68.97	6.3

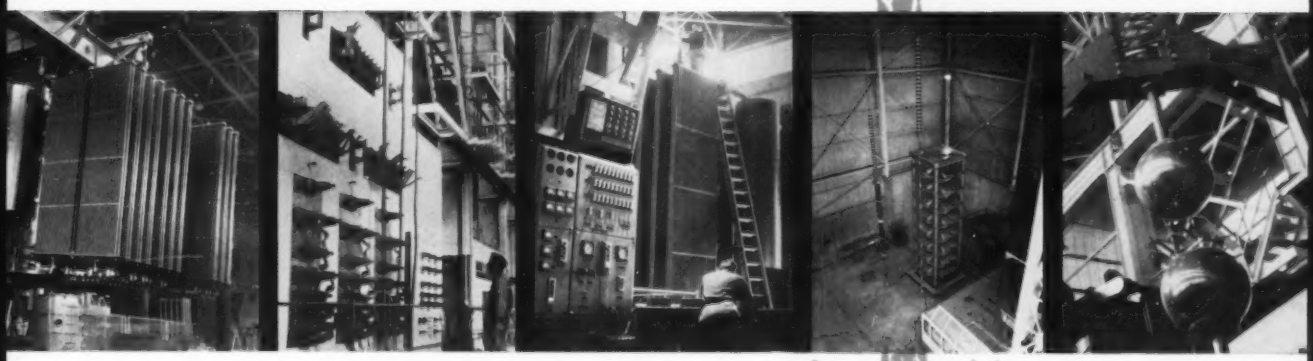
Business Statistics . . .

Indexes: 1947–49 = 100					
FRB Industrial Production	Mar.	145	144	138	5.1
ENR Construction Cost	April	143.2	142.8	135.7	5.5
BLS Cost-of-living	Feb.	114.6	114.6	114.3	0.3
NEMA Sales	Feb.				
Insulation materials		163	159	137	19.0
Electric appliances		109	105	107	1.9
Wholesale prices	Feb.				
Motors and generators		126.6	126.5	121.0	4.6
Transformers and regulators		131.2	131.2	127.8	2.7
Switchgear and fuses		147.5	147.5	135.4	8.9
GNP—annual rate—$ billion	4th Qtr.	397.3	392.0	367.1	8.2

TESTING

When ordering power transformers—consideration should be given to the performance record of the manufacturer. To assure proper performance, extensive test facilities are necessary. Moloney has constantly expanded their testing facilities to maintain an enviable record of performance and reliability.

NES5-30



When you specify Moloney, you specify *proven* "Dependability at its Best."

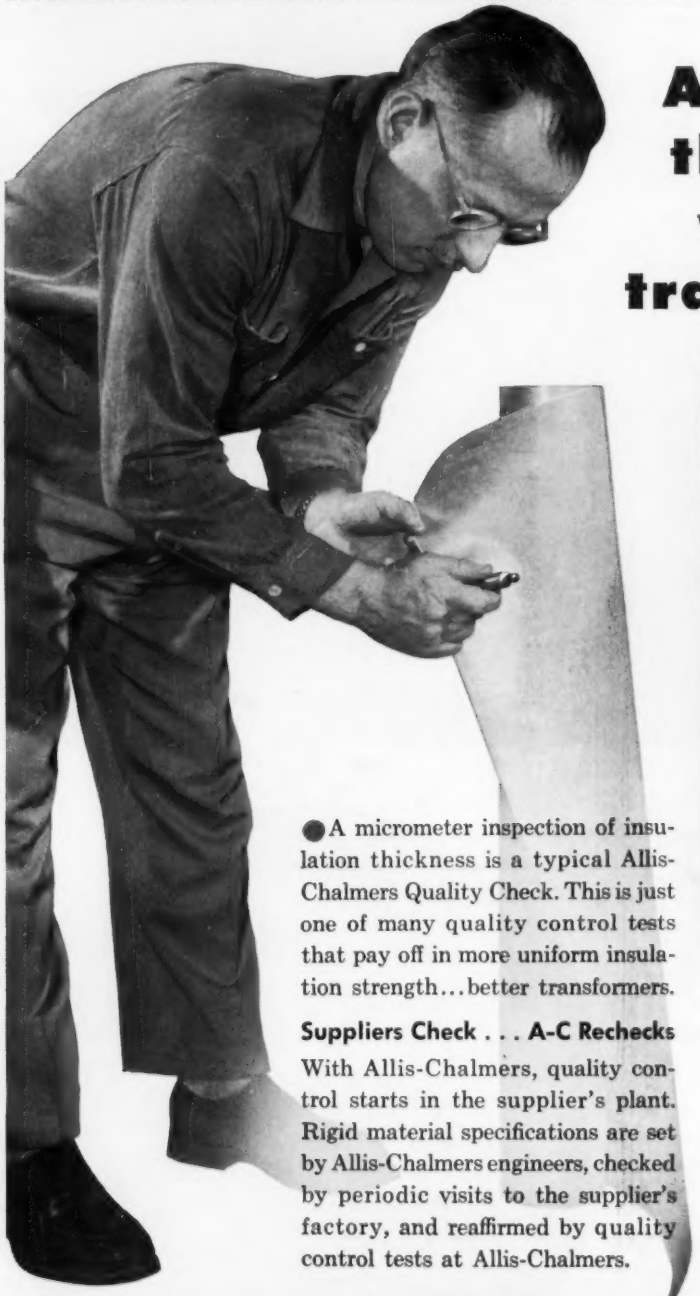
MOLONEY ELECTRIC COMPANY

Power Transformers • Distribution Transformers
Step Voltage Regulators • Regulating Transformers
Load Tap Changing Transformers • Load Center Transformers • Unit Substations
Network Transformers • Constant Current Transformers • Capacitors
Transformers For Electronics

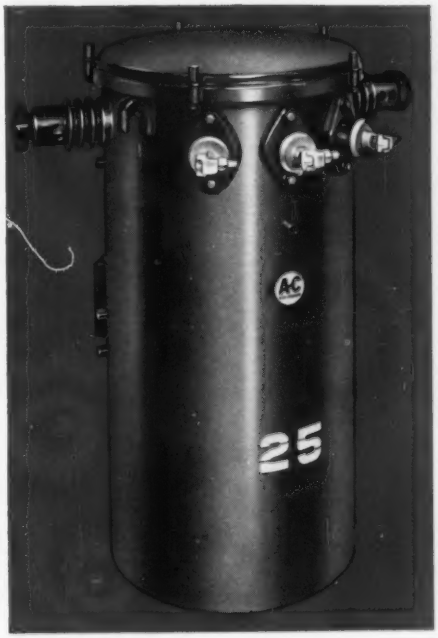
MOLONEY ELECTRIC

SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES AT ST. LOUIS, MO. AND TORONTO, CAN.

Quality Control at Allis-Chalmers



A "Check" that pays off with longer transformer life



●A micrometer inspection of insulation thickness is a typical Allis-Chalmers Quality Check. This is just one of many quality control tests that pay off in more uniform insulation strength... better transformers.

Suppliers Check . . . A-C Rechecks

With Allis-Chalmers, quality control starts in the supplier's plant. Rigid material specifications are set by Allis-Chalmers engineers, checked by periodic visits to the supplier's factory, and reaffirmed by quality control tests at Allis-Chalmers.

For the Complete Story on quality control at Allis-Chalmers

. . . and what it means to you, call your nearby Allis-Chalmers office, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin for new Bulletin 61B8355.

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A-C ALLIS-CHALMERS

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